

U.S. Mines Bureau

Bulletin 165

DEPARTMENT OF THE INTERIOR

FRANKLIN K. LANE, SECRETARY

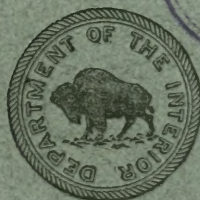
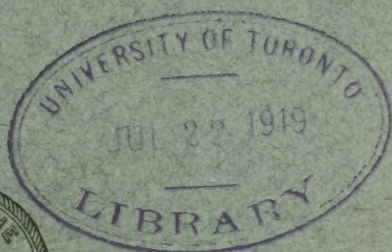
BUREAU OF MINES

VAN. H. MANNING, DIRECTOR

BIBLIOGRAPHY OF PETROLEUM AND
ALLIED SUBSTANCES IN 1916

BY

E. H. BURROUGHS



ENGINEERING

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BIBLIOGRAPHY OF PETROLEUM AND ALLIED SUBSTANCES, 1916.

By E. H. BURROUGHS.

INTRODUCTION.

This bibliography follows the same general scheme as the bibliography of petroleum and allied substances for 1915.^a The names of the publications read are given in the list that follows. This list is practically the same as that for the 1915 bibliography, except that copies of the German publications, outside of a few scattered numbers, could not be obtained. References to articles in these journals have been taken from such sources as were available and credit has been given to those sources. American and foreign patents have been entered by title, without abstracts. A few minor changes have been made in the scheme of classification, which is, on the whole, the same as that given in the 1915 bibliography.

ACKNOWLEDGMENT.

Acknowledgment is made to Messrs. J. O. Lewis, C. P. Bowie, J. M. Wadsworth, and E. W. Dean, of the petroleum division of the bureau, for assistance in arranging the references under the classification. The classified references were examined and prepared for publication by Miss H. C. McGown, bibliographer.

PUBLICATIONS EXAMINED.

SERIALS.

The following list contains the names of the serials examined in preparing this bibliography and the abbreviations used in the text references:

American Chemical Society, journal.....	Jour. Am. Chem. Soc.
American Gas Light Journal.....	Am. Gas Light Jour.

^a Burroughs, E. H., Bibliography of petroleum and allied substances, 1915: Bull. 149. Bureau of Mines, 1918. 147 pp.

- American Institute of Mining Engineers, bulletin.....Bull. Am. Inst. Min. Eng.
 American Institute of Mining Engineers, transactions...Trans. Am. Inst. Min. Eng.
 American Leather Chemists Association, journal.....Jour. Am. Leather Chemists
 Assoc.
 American Mining Congress, proceedings.....Proc. Am. Min. Congress.
 American Society of Civil Engineers, proceedings....Proc. Am. Soc. Civ. Eng.
 American Society of Mechanical Engineers, journal....Jour. Am. Soc. Mech. Eng.
 American Society of Naval Engineers, journal.....Jour. Am. Soc. Naval Eng.
 American Society for Testing Materials, proceedings Proc. and Year Book Am. Soc.
 and year book. Test Materials.
 Automobile.....Automobile.
 Berichte der Deutschen Chemischen Gesellschaft Ber. Deut. chem. Gesell.
 (Jan., Feb., Mar.).
 Boletín del Petróleo.....Bol. del Petróleo.
 California Academy of Sciences, proceedings.....Proc. California Acad. Sci.
 California Derrick.....California Derrick.
 Canadian Engineer.....Canadian Engineer.
 Canadian Mining Institute, bulletin.....Bull. Canadian Min. Inst.
 Canadian Mining Institute, transactions.....Trans. Canadian Min. Inst.
 Canadian Mining Journal.....Canadian Min. Jour.
 Chemical Abstracts.....Chem. Abs.
 Chemical Society, journal.....Jour. Chem. Soc.
 Chemische Industrie (Jan. and Feb.).....Chem. Ind.
 Chemische Umschau auf dem Gebiete de Fette, Oele, Chem. Umschau.
 Wachse und Harze (May to Nov.).
 Chemiker Zeitung (Jan. 1 to Apr. 26).....Chem. Ztg.
 Cleveland Engineering Society, journal.....Jour. Cleveland Eng. Soc.
 Cornell Civil Engineer.....Cornell Civ. Eng.
 Economic Geology.....Econ. Geol.
 Engineer.....Engineer.
 Engineering.....Engineering.
 Engineering and Contracting.....Eng. and Contr.
 Engineering and Mining Journal.....Eng. and Min. Jour.
 Engineering Magazine (Changed to Industrial Man- Eng. Mag.
 agement, Nov., 1916).
 Engineering News.....Eng. News.
 Engineering Record.....Eng. Rec.
 Engineers' Society of Western Pennsylvania, proceed- Proc. Eng. Soc., Western
 ings. Pennsylvania.
 Franklin Institute, journal.....Jour. Franklin Inst.
 Fuel Oil Journal (Changed to Oil Trade Journal, Fuel Oil Jour.
 Nov., 1916).
 Gas Age.....Gas Age.
 Gas World.....Gas World.
 Génie Civil.....Génie Civil.
 Geological Magazine.....Geol. Mag.
 Geological Society of America, bulletin.....Bull. Geol. Soc. Am.
 Glückauf (Jan. 1-June 3).....Glückauf.
 Good Roads.....Good Roads.
 Horseless Age.....Horseless Age.
 Industrial Management (See Engineering Magazine).
 Institution of Mining Engineers, transactions.....Trans. Inst. Min. Eng.
 Institution of Petroleum Technologists, journal.....Jour. Inst. Petroleum Tech.
 International Marine Engineering.....Int. Marine Eng.

Journal of Electricity, Power, and Gas.....	Jour. Elec. Power and Gas.
Journal für Gasbeleuchtung und Wasserversorgung....	Jour. Gasbel.
Journal of Geology.....	Jour. Geol.
Journal of Industrial and Engineering Chemistry....	Jour. Ind. and Eng. Chem.
Metallurgical and Chemical Engineering.....	Met. and Chem. Eng.
Mining and Engineering World.....	Min. and Eng. World.
Mining and Oil Bulletin.....	Min. and Oil Bull.
Mining and Scientific Press.....	Min. and Sci. Press.
Municipal Journal.....	Munic. Jour.
Natural Gas Journal.....	Nat. Gas Jour.
National Fire Protection Association, quarterly.....	Nat. Fire Protect. Assoc. Quart.
National Petroleum News.....	Nat. Petroleum News.
La Nature.....	La Nature.
Der Oelmotor (Jan.-Mar.).....	Oelmotor.
Oil Age.....	Oil Age.
Oil and Gas Journal.....	Oil and Gas Jour.
Oil and Gas Man's Magazine.....	Oil and Gas Man's Mag.
Oildom.....	Oildom.
Oil, Paint, and Drug Reporter.....	Oil, Paint, and Drug Rep.
Oil Trade Journal (see Fuel Oil Journal).....	
Petroleum Age.....	Petroleum Age.
Petroleum Review.....	Petroleum Rev.
Petroleum World.....	Petroleum World.
Petroleum Zeitschrift (Jan.-Sept., except Nos. 12-14).....	Petroleum Ztschr.
Power.....	Power.
Practical Engineer.....	Prac. Eng.
Railway Age Gazette.....	Rwy. Age Gaz.
Railway Review.....	Rwy. Rev.
Resources of Tennessee.....	Resources of Tennessee.
Royal Society of Arts, journal.....	Jour. Roy. Soc. Arts.
S. A. E. Bulletin.....	S. A. E. Bull.
Scientific American.....	Sci. Am.
Scientific American Supplement.....	Sci. Am. Suppl.
Society of Chemical Industry, journal.....	Jour. Soc. Chem. Ind.
Society of Engineers (London), transactions.....	Trans. Soc. Eng.
Standard Oil Bulletin.....	Standard Oil Bull.
Texaco Star.....	Texaco Star.
Washington Academy of Sciences, journal.....	Jour. Wash. Acad. Sci.
Western Engineering.....	West. Eng.
Western Society of Engineers, journal.....	Jour. Western Soc. Eng.
Worcester Polytechnic Institute, journal.....	Jour. Worcester Polytech. Inst.
Zeitschrift für angewandte Chemie (Jan. 4-May 5).....	Ztschr. angew. Chem.

OFFICIAL PUBLICATIONS.

Official publications of the Government that were consulted in preparing this bibliography were as follows:

- Bureau of Mines, bulletins and technical papers.
- Bureau of Standards, circulars and technologic papers.
- Corps of Engineers, professional memoirs.
- Geological Survey, bulletins, professional papers, geologic folios, Mineral Resources of United States for 1915, pt. 2, Non-metals.
- Department of Agriculture, bulletins.
- Department of Commerce, Daily Commerce Reports.

United States Artillery Journal.

Such reports of State geological surveys and mining bureaus and foreign geological surveys and mining bureaus as were published in 1916.

References to foreign patents give the date of application when only one date is given, and dates of acceptance and of application when two dates are given.

SCHEME OF CLASSIFICATION.

The scheme of classification followed in arranging the references is outlined below.

CLASSIFICATION OF SUBJECTS.

MAIN CLASSES.

- 000 General treatises.
- 100 Countries and regions.
- 200 Geology and origin.
- 300 Development and production.
- 400 Transportation, storage, and distribution.
- 500 Properties and their determination.
- 600 Refining and refineries.
- 700 Utilization.
- 800 Legislation and legal regulations.
- 900 Miscellaneous.

DETAILED OUTLINE OF CLASSIFICATION.

- 000 General treatises.
- 100 Countries and regions. (Under each locality follow the classification given under "North America.")
 - 110 North America.
 - 110.001 Historical references and geographic occurrence.
 - .002 Geology and origin.
 - .003 Development and production.
 - .004 Transportation, storage, and distribution.
 - .005 Properties and their determination.
 - .006 Refining and refineries.
 - .007 Utilization.
 - .008 Statistics (includes field development, Crude production, Transportation, storage, and distribution, Refineries and refined products, Consumption, Trade reports, Financial and market statistics, General review of the industry).
 - .009 Legal regulations, economics, maps, miscellaneous.
 - 111 United States.
 - (Subdivided like class 110.)
 - 111.1 Appalachian field.
 - 111.11 Indiana.
 - .12 Kentucky.
 - .13 New York.
 - .14 Ohio.
 - .15 Pennsylvania.
 - .16 West Virginia.
 - .19 Other States (includes Delaware, Maryland, New Jersey, and Virginia).

100 Countries and regions—Continued.

110 North America—Continued.

111 United States—Continued.

111.2 Illinois field.

111.3 Mid-Continent field.

111.31 Kansas.

.32 Louisiana (northern).

.33 Oklahoma.

.34 Texas (eastern and northern).

.39 Other States (includes Arkansas, Iowa, Michigan, Minnesota, Missouri, Nebraska, and Wisconsin).

111.4 Gulf Coast field.

111.41 Louisiana (coastal).

.42 Texas (coastal).

111.5 Rocky Mountain field.

111.51 Colorado.

.52 Montana.

.53 Utah.

.54 Wyoming.

.59 Other States (includes Arizona, Idaho, Nevada, New Mexico, North Dakota, South Dakota).

111.6 Pacific Coast field.

111.61 California.

.62 Oregon.

.63 Washington.

111.9 Miscellaneous.

111.91 Alaska.

.99 Other States (includes Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee).

112 Canada.

113 Mexico.

114 Central America (includes Costa Rica, Guatemala, Honduras, Nicaragua, Panama, and Salvador).

115 West Indies.

115.1 Barbados.

.2 Cuba.

.3 Trinidad.

.9 Other islands (includes Haiti, Porto Rico, and Santo Domingo).

120 South America.

121 Argentina.

122 Peru.

129 Other countries (includes Bolivia, Brazil, the Guianas, Chile, Colombia, Ecuador, Falkland Islands, Uruguay, and Venezuela).

130 Europe.

131 Austria-Hungary.

133 Germany.

134 Great Britain.

136 Roumania.

137 Russia (includes Siberia, Transcaucasia, and Turkestan).

138 Turkey (includes Turkey in Asia).

Countries and regions—Continued.

- 130 Europe—Continued.
 - 139 Other countries (includes Balkan States, Belgium, Denmark, France, Greece, Holland, Italy, Norway and Sweden, Spain and Portugal, and Switzerland).
- 140 Asia.
 - 141 China.
 - 142 India.
 - 143 Japan.
 - 149 Other countries (includes Afghanistan, Arabia, Korea, Persia, and Siam. For Asiatic Russia, *see* Russia in Europe).
- 150 Africa.
- 160 Oceania and Malaysia.
 - 161 Australia.
 - 162 Borneo, Java, and Sumatra.
 - 163 New Guinea (Papua).
 - 164 New Zealand.
 - 165 Philippines.
 - 169 Other islands (includes New Caledonia and Timor).
- 200 Geology and Origin. (*See also* class 100.)
 - 210 General geology.
 - 220 Stratigraphic distribution.
 - 230 Lithology of bituminous rocks.
 - 240 Geologic structure.
 - 250 Origin—theories.
 - 251 Inorganic.
 - 252 Organic.
 - 260 Accumulation.
 - 260.1 Oil and gas reservoir pressures.
 - 270 Applied geology.
 - 270.1 Determination of oil and gas fields.
- 300 Development and production (oil and gas). (*See also* class 100.)
 - 310 Drilling (methods, tools, and equipment).
 - 311 Drilling methods.
 - 311.1 Percussion.
 - .2 Rotary.
 - 312 Drilling tools.
 - 312.1 Percussion.
 - .2 Rotary.
 - 313 Equipment.
 - 313.1 Rigs and derricks, and parts thereof.
 - .2 Power.
 - .3 Casing and fittings.
 - 313.31 Protection against corrosion.
 - 314 Water and waste, control.
 - 314.1 Cement.
 - .2 Packers.
 - .3 Mud fluid.
 - .9 Other methods.
 - 315 Control of large wells and wells on fire.
 - 316 Use of explosives, shooting.
 - 317 Plugging and abandoning.
 - 318 Records of formation, cost, etc.

- 300 Development and production (oil and gas) — Continued.
 - 320 Production (methods, equipment, and operations).
 - 321 Flowing oil wells.
 - 322 Pumping oil wells.
 - 322.1 Tools and equipment.
 - .2 Power.
 - .3 Operations.
 - .4 Special pumping methods.
 - 323 Other methods of oil production.
 - 323.1 Bailing.
 - .2 Swabbing.
 - .3 Air lifts.
 - 324 Care of producing oil wells.
 - 324.1 Cleaning out.
 - .2 Heating and steaming, paraffination.
 - .3 Agitating.
 - .4 Use of explosives.
 - .5 Operation of wells producing water.
 - .6 Operation of wells with loose sand.
 - .7 Miscellaneous.
 - 325 Gas wells.
 - 328 Records and costs.
 - 330 Production, gathering, and treatment.
 - 331 Oil.
 - 331.1 Gaging and metering.
 - .2 Gathering systems.
 - .3 Cleaning and treating for water, B. S., etc.
 - .4 Disposal of refuse.
 - 332 Gas and vapors.
 - 332.1 Gaging and metering.
 - .2 Gathering systems.
 - .3 Compressors and condensers.
 - .4 Separation from oil or water.
 - 333 Records and costs.
 - 340 Productiveness of oil and gas wells and lands.
 - 341 Natural factors.
 - 341.1 Character of producing strata.
 - .2 Character of oils.
 - .3 Gas and gas pressures.
 - .4 Geologic conditions.
 - .5 Influence of water.
 - .6 Causes of decline.
 - 342 Artificial factors, stimulation of production.
 - 342.1 Mechanical.
 - 342.11 Decrease of pressure.
 - .42 Increase of pressure by air or gas.
 - .43 Use of water.
 - .2 Spacing of wells.
 - .3 Economic.
 - .4 Stimulation of production.
 - 343 Records and statistics.
 - 343.1 Graphic and other recording methods.
 - .2 Productiveness of wells.
 - .3 Productiveness of oil lands.
 - 344 Estimating content of oil and gas lands.

- 300 Development and production (oil and gas)—Continued.
 - 350 Wastes and conservation.
 - 360 Mining solid bitumens.
 - 390 Financial (appraisements, royalties, contracts, costs, prices).
- 400 Transportation, storage, and distribution. (*See also* class 100.)
 - 410 Transportation.
 - 411 Pipe lines (oil or gas).
 - 411.1 Construction and maintenance.
 - 411.11 Protection against corrosion.
 - .2 Station equipment.
 - .3 Line equipment and tools.
 - 411.31 Main lines.
 - .32 Laterals.
 - .4 Operations.
 - .5 Losses.
 - .6 Records and statistics, maps.
 - .7 Financial, costs.
 - 412 Tank cars and tank wagons.
 - 412.1 Construction and maintenance.
 - .2 Records and statistics.
 - .3 Financial, costs.
 - 413 Water transportation.
 - 413.1 Tank steamers.
 - 413.11 Construction and maintenance.
 - .12 Records and statistics.
 - .13 Financial.
 - 413.2 Barges and other modes of conveyance.
 - 420 Storage.
 - 421 Tanks.
 - 421.1 Steel and iron.
 - .2 Concrete.
 - .3 Wooden.
 - 422 Reservoirs.
 - 422.1 Earthen.
 - .2 Concrete-lined.
 - 424 Tank and reservoir equipment.
 - 425 Temporary and small containers.
 - 425.1 Equipment.
 - 426 Storage and tank farms.
 - 427 Losses.
 - 428 Records, statistics, maps.
 - 429 Financial.
 - 430 Measurement of volumes and weights; gaging and metering.
 - 440 Fire hazards and prevention.
 - 450 Local distribution.
 - 460 Sampling.
 - 470 Legislation and regulation.
 - 490 Financial.
- 500 Properties and their determination. (*See also* class 100.)
 - 510 Physical properties.
 - 511 Molecular weight.
 - 512 Optical.
 - 512.1 Refractivity.
 - .2 Polarization.
 - .3 Photochemical.

500 Properties and their determination—Continued.

510 Physical properties—Continued.

513 Density (specific gravity) and coefficient of expansion.

514 Thermal.

514.1 Specific heat and latent heats.

.2 Boiling points and vapor pressures. Evaporation, volatility, fractional distillation.

.3 Melting points, crystallization, cold tests, coagulating point.

515 Lubricating value.

518 Other properties of liquids: Viscosity, surface tension, capillarity, diffusion, filtration, solubility, fractional precipitation, emulsion, adsorption, compressibility, electrical.

519 Other properties of solids: Hardness, ductility, toughness, consistency, penetrometry, viscosity.

520 Chemical properties.

521 Thermochemical.

521.1 Flash and burning points, ignition points and ignition mixtures.

.2 Calorific power and calorimetry.

.3 Illuminating power, burning qualities and photometry.

.4 Thermal decomposition or "cracking."

521.9 Miscellaneous, including properties such as heat of formation, heat of reaction.

523 Elementary analyses.

523.1 Carbon and hydrogen.

.2 Sulphur.

.3 Nitrogen.

.4 Halogens.

524 Analytical numbers (iodine, bromine, saponification, amyl, sulphuric acid, absorption, etc.).

525 Hydrocarbons, hydrocarbon derivatives.

525.1 Oxygen compounds.

525.11 Cholesterol.

.12 Petroleum acids and acid content.

.2 Halogen compounds.

.3 Reduced hydrocarbons, hydrogenation and catalysis.

.4 Nitrogen derivatives.

526 Water and solid impurities, sand, B. S., etc.

527 Ash content.

528 Detection of mixtures and adulterants.

529 Miscellaneous and specific tests.

530 Physiological properties.

540 Analytical methods: determination of physical and chemical properties; apparatus and procedure.

550 Power and efficiency tests.

560 Specifications for purchases, etc.

570 Various species and fractions of bitumens and petroleum.

571 Crude oils.

572 Gaseous products, including natural gas.

573 Volatile fractions, including motor oils, gasolines, naphthas, benzines.

574 Illuminating oils.

- 500 Properties and their determination—Continued.
 - 570 Various species and fractions of bitumens and petroleum—Continued.
 - 575 Lubricating, transformer, and switch oils.
 - 576 Residues.
 - 577 Paraffin, ozokerite, ceresin, vaseline, etc.
 - 578 Asphalt, tars, etc.
 - 579 Shales, miscellaneous solid bitumens, lampblack, and coke.
 - 590 Miscellaneous.
- 600 Refining and refineries. (*See also class 100.*)
 - 610 Processes and practices.
 - 611 Dehydrating and cleaning.
 - 612 Distillation of liquids.
 - 612.1 Continuous.
 - .2 Batch.
 - .3 With inert gases or steam.
 - 613 Cracking of liquids.
 - 613.1 Continuous.
 - .2 Batch.
 - .3 With catalyzers.
 - .4 Gasifying and production of lampblack and coke.
 - 614 Distillation of solids.
 - 614.1 Oil shales.
 - .2 Peat.
 - 615 Condensation.
 - 616 Treatment to improve properties.
 - 616.1 Chemical.
 - 616.11 Hydrogenation, oxygenation, halogenation, nitration, and catalysis.
 - .12 Sulphuric and sulphurous acid refining.
 - .13 By-products and recovery of reagents.
 - .14 Oxidation, hardening, and saponification.
 - .15 Bleaching.
 - 616.2 Physical.
 - 616.21 Processes.
 - 616.211 Filtration, refrigeration, and compression.
 - .212 Extraction.
 - .213 Emulsification.
 - .22 Materials.
 - .23 Apparatus.
 - 616.3 Mechanical.
 - 616.31 Centrifugal.
 - .32 Crushers and breakers.
- 620 Specific products and their manufacture.
 - 621 Gasoline, including natural-gas gasoline.
 - 622 Lubricants.
 - 623 Paraffin, vaseline, ceresin, and montan wax.
 - 624 Asphalt.
 - 625 Medicinal oils.
- 630 Losses, disposal of wastes, fire hazards and prevention.
- 640 Records and statistics.
- 650 Construction, equipment and materials.
- 690 Miscellaneous.

700 Utilization. (*See also* class 100.)

710 Light.

711 Gas illumination.

712 Liquid fuel illumination.

713 Solid fuel illumination.

720 Heat and power.

721 Steam raising.

721.1 On locomotives.

.2 On ships.

722 Industrial.

722.1 Metallurgical, foundry, and like industries.

.2 Other uses.

723 Furnaces.

724 Burners and burner appliances.

725 Internal-combustion engines (theory and uses).

725.1 Gas engines.

.2 Gasoline engines.

.3 Diesel engines.

.4 Miscellaneous heavy-oil engines.

.5 Carburetors, vaporizers, and sprayers.

726 Bitumen fuels for internal-combustion engines.

726.1 Fuels for gas and gasoline engines.

.2 Fuels for heavy-oil engines.

727 Substitutes for bituminous fuels in internal-combustion engines.

727.1 Alcohol.

.2 Benzol.

.4 Tar and tar oils.

.9 Other substitutes.

728 Domestic heating.

730 Structural purposes.

731 Pavement and road building, and maintenance.

732 Roofing.

733 Water proofing and preserving.

734 Paints and paint vehicles (including detection of petroleum substitutes in paint vehicles).

740 Lubrication.

750 Medicinal and pharmaceutical uses.

760 Distribution and marketing methods.

770 Consumption, finances, records, and statistics.

780 Fire hazards.

790 Miscellaneous uses.

791 Boiler compounds.

792 Insecticides and disinfectants.

793 Ore flotation.

794 Manufactured fuels.

795 Dyes and explosives.

796 Soaps.

799 Other uses.

800 Legislation and legal regulations. (*See also* class 100.)

810 Exploration.

820 Development and production.

830 Transportation, storage, and distribution.

840 Testing and inspection of quality.

- 850 Refining.
 - 860 Utilization and trade.
 - 870 Tariff.
 - 880 Miscellaneous.
- 900 Miscellaneous.
 - 910 Nomenclature.
 - 920 Bibliographies.
 - 930 Organizations and institutions.
 - 940 Expositions and exhibitions.
 - 950 Commerce, trade, and economics.
 - 990 Other articles and publications.

BIBLIOGRAPHY.

GENERAL TREATISES.

1. GRAY, T. T. The petroleum industry. New York, 1916. 32 pp. Reprint of Chapter 22 in "Industrial Chemistry, a manual for the student and manufacturer," by Allen Rogers. 2nd ed., 1915.
- 1a. HENDERSON, J. A. L. The natural gas industry, its progress and importance. Jour. Inst. Petroleum Tech., vol 2, April, 1916, pp. 195-221; discussion, pp. 222-226. Reviews progress and discusses use of natural gas as a fuel.
2. RIES, HEINRICH. Economic geology. New York, 1916, 4th ed., pp. 70-137. Gives general information on petroleum, natural gas, and other hydrocarbons. Describes mode of occurrence, accumulation, and distribution of both oil and gas. Contains bibliography on petroleum.
3. THOMPSON, A. B. Oil-field development and petroleum mining. London, 1916, 648 pp. Describes the geographic distribution, geology, origin, and chemistry of petroleum. Discusses well-drilling, producing methods, and equipment, also the economic and financial aspects of the industry.

COUNTRIES AND REGIONS.

NORTH AMERICA.

HISTORICAL REFERENCES—OCCURRENCE—GEOLOGY AND ORIGIN.

4. ARNOLD, RALPH. Conservation of the oil and gas resources of the Americas. *Econ. Geol.*, vol. 11. Apr.-May, 1916, pp. 203-222; June, 1916, pp. 299-326; *Proc. 2nd Pan American Sci. Cong.*, 1915-1916, vol. 3, Conservation of natural resources, pp. 207-237. Shows occurrence of oil, and status and possibilities of oil industry in each country. Discusses briefly ways in which oil reserves may be conserved.
5. RUTIS, A. A. Petroleum known since remote times. *Oil and Gas Jour.*, vol. 15, Nov. 2, 1916, pp. 33, 37. Gives historical references to the use of petroleum from Bible times to its discovery in America.
See also Nos. 3, 257, 262, 337, 1343.

UNITED STATES.

OCCURRENCE—GEOLOGY.

6. ARNOLD, RALPH. Petroleum resources of the United States. *California Derrick*, vol. 9, March, 1916, pp. 6-7. Describes briefly extent of field, geologic occurrence of oil, its quantity and quality, average daily production, and future prospects.
 7. BACON, R. F., AND HAMOR, W. A. The American petroleum industry; with special chapters by F. G. Clapp, R. H. Johnson, J. P. Cappeau, and L. G. Huntley. New York, 1916, 2 vols., 963 pp. Describes geology of petroleum and gives a comprehensive survey of the petroleum industry. (*See also* Nos. 312, 336, 483, 494, 498, 1343.)
- DEVELOPMENT AND PRODUCTION. *See* Nos. 7, 337, Transportation, etc.; *see* Nos. 536, 537.

PROPERTIES AND THEIR DETERMINATION.

8. BLAIR, H. W., AND PEPPER, E. L. Density and thermal expansion of American petroleum oils. *Tech. Paper 77*, U. S. Bureau of Standards, 1916, 26 pp. Describes experiments to obtain data for calculating standard density and volumetric tables published in U. S. Bureau of Standards Circular 57, 1916. (*See also* No. 9.)
9. UNITED STATES BUREAU OF STANDARDS. United States standard tables for petroleum oils. Circular 57, 1916, 64 pp. Gives specific gravity and Baumé tables to be applied to all petroleum oils, whether crude or refined, produced in the United States.
10. RITTMAN, W. F., JACOBS, W. A., AND DEAN, E. W. Physical and chemical properties of gasolines sold throughout the United States during the calendar year 1915. *Tech. Paper 163*, U. S. Bureau of Mines, 1916, 45 pp. Gives results of tests of fifty-two samples of gasoline, also specifications for purchase and sale of gasoline.
See also Nos. 6, 7, 257.

REFINING AND REFINERIES.

11. JAMES, H. G. Oil refineries of the United States. *Oil and Gas Jour.*, vol. 15, Aug. 17, 1916, pp. 28-29; Aug. 24, 1916, pp. 28-31; Aug. 31, 1916, pp. 27-30, 34, 35; Sept. 7, 1916, pp. 31-35, 37. Reviews conditions in the refining industry and gives facts and figures regarding the refineries and their products.
See also No. 7.

STATISTICS.

GENERAL REVIEW.

12. DAY, D. T. Petroleum and natural gas. Mineral industry during 1915, New York, 1916, pp. 525-552. Reviews progress in the United States and foreign countries. Gives petroleum statistics of production, field development, exports, and prices.
13. *Oil and Gas Journal*. Review of oil and gas industry in United States and Mexico in 1915. Vol. 14, Jan. 13, 1916, pp. 10-28. A general review by fields, giving development, production, etc.
14. *Oil and Gas Man's Magazine*. Review of the oil industry in 1915. Vol. 11, Jan., 1916, pp. 328-338. Compares production, prices, field development, and gives statistics for 1914.
15. REQUA, M. L. Petroleum resources of the United States. Senate Doc. 363, 64th Cong., 1st Sess., 1916, 18 pp. Discusses exhaustion of petroleum resources of United States, shows present and future supply and demand, and gives production of principal oil fields.
16. RICHARDSON, CLIFFORD. Asphalt. Mineral Industry during 1915, New York, 1916, pp. 48-54. Describes varieties of asphalt, including special characteristics of Trinidad asphalt. Gives production figures for the United States, Barbados, and Cuba, and imports into the United States and exports from Trinidad.

FIELD DEVELOPMENT, NATURAL GAS.

17. *Natural Gas and Gasoline Journal*. Gives location and description of new wells drilled in Kentucky and Tennessee, Ohio, Pennsylvania, West Virginia, Illinois, Indiana, Kansas, Louisiana, Oklahoma, and Texas, also gives summaries for all fields, by districts.

FIELD DEVELOPMENT, OIL AND GAS.

18. *Oil and Gas Journal*. Monthly statement gives location and initial production of completed wells, location of drilling wells, and summary for each field by districts, with comparisons for preceding months.
19. United States Geological Survey. Mineral Resources for 1915, pt. 2, Nonmetals. Yearly report of field developments, by States.

IMPORTS AND EXPORTS OF PETROLEUM.

20. United States Bureau of Foreign and Domestic Commerce. Monthly summary of foreign commerce of the United States.

LIST OF NEW INCORPORATIONS.

21. *Natural Gas and Gasoline Journal*. Monthly statement lists new companies, chiefly gas companies, in the different States.
22. *Oil Trade Journal*. Monthly list of recent oil and gas incorporations.
23. *Petroleum*. Monthly statement lists new companies in the different States.

PIPE-LINE STATISTICS.

24. *Oil and Gas Journal*. Monthly report gives runs, deliveries, and stocks in the Kansas-Oklahoma region, Texas panhandle, Caddo district, Louisiana, California, Pennsylvania and Illinois field.

25. Petroleum Age. Monthly statement, by fields and pipe lines, of runs from wells, other receipts, deliveries, and gross stocks, with comparative figures for the preceding eleven months.
26. United States Geological Survey. Mineral Resources for 1915, pt. 2, Nonmetals. Gives annual statistics.

PRICES.

27. National Petroleum News. Monthly statement of crude oil prices, all grades.
28. Oil Age. Gives monthly statement of crude oil prices, all grades; also prices of refined products in Los Angeles.
29. Oil and Gas Journal. Weekly report of prices of crude oil throughout the United States.
30. Oil Trade Journal. Contains monthly statement of prices of crude oil for all fields.
31. Petroleum. Contains monthly statement of prices of all grades of crude oil.
32. United States Geological Survey. Mineral Resources for 1915, pt. 2, Nonmetals. Yearly report gives prices in all fields.

PRODUCTION.

33. United States Geological Survey. Mineral Resources for 1915, pt. 2, Nonmetals. Gives annual output and value of petroleum, natural gas, and asphalt, by States.

TANKAGES.

34. Petroleum Age. Monthly statement gives summary of oil in tankage, by fields.

LEGAL REGULATIONS.

35. UNITED STATES CONGRESS, SENATE, COMMITTEE ON PUBLIC LANDS. Exploration for and disposition of oil, gas, etc. 64th Cong., 1st Sess., Rept. No. 319, March 30, 1916, 10 pp.; pt. 2, May 31, 1916, 13 pp. Report on House bill No. 406 and substitute bill to authorize exploration for and disposition of coal, phosphate, oil, potassium, or sodium. Mentions acts passed withdrawing oil and gas lands, etc., from entry. Urges relief as contained in bill.
36. ——— Exploration for and disposition of coal, phosphate, oil, gas, etc. 64th Cong., 1st Sess., Rept. No. 319, pt. 2, to accompany H. R. 406, May 31, 1916, 13 pp. Minority views of committee.
37. United States Congress, House, Committee on Public Lands. Exploration for and disposition of coal, oil, gas, etc. 64th Cong., 1st Sess., Rept. No. 17, to accompany H. R. 406, Jan. 4, 1916, 12 pp; pt. 2, Minority views, Jan. 5, 1916, 38 pp. Report recommends the passage of the bill, which provides for a method of leasing, on a royalty basis, deposits of mineral fuels, etc., on the public lands of the United States. Minority views are also given.

See also Nos. 1319-1322.

APPALACHIAN FIELD.

STATISTICS.

AVERAGE DAILY OIL PRODUCTION AND SHIPMENTS.

33. Petroleum Age. Monthly statement for Appalachian and Lima-Indiana fields for each month of the last five years.

See also Nos. 12-19, 24-26, 33, 34.

INDIANA.

39. CULBERTSON, GLENN. Geology and natural resources of Jefferson County, Indiana. Indiana Dept. of Geology and Nat. Res., Rept. for 1915. 1916, pp. 223-239. Mentions natural gas among the economic products of the county. Discusses its production from three wells and the uncertainty of finding more in paying quantities.
40. VAN GORDER, W. B. Geology of Greene County, Indiana. Indiana Dept. of Geology and Nat. Res., 40th Ann. Rept., 1915. 1916, pp. 249-266. Gives a short account of the petroleum and natural gas resources of the county; production is slight.
41. WRIGHT, F. E. Oil and gas in Indiana. Indiana Dept. of Geology and Nat. Res., 40th Ann. Rept., 1915. 1916, pp. 267-173. Reviews general conditions and developments in the oil and gas fields of this State during 1915. Statistics, *see* Nos. 12-19, 21-34; Legal regulations, *see* No. 96.

KENTUCKY.

HISTORICAL REFERENCES AND GEOGRAPHIC OCCURRENCE.

42. OIL AND GAS JOURNAL. Kentucky as an oil-producing State. Vol. 14, Mar. 2, 1916, pp. 33-35. History of early operations since the discovery of oil. Hints as to prospects.

GEOLOGY AND ORIGIN.

43. BAILEY, CHARLES. Mississippian section in west-central Kentucky. Bull. Geol. Soc. Am., vol. 27, March 31, 1916, pp. 155-156, Abstract. Gives the geologic formations of the section.
44. FORTS, F. J. Oil and gas possibilities of Kentucky. Trans. Am. Inst. Min. Eng., vol. 51, 1916, pp. 649-656. A study of the structure of the Kentucky fields. Discusses chances for oil pools in the State.
45. LEE, WALLACE. Geology of the Shawneetown Quadrangle in Kentucky. Kentucky Geol. Survey, 1916, 73 pp. Discusses oil indications in this region; conditions are not promising for commercial deposits.
46. MILLER, A. M. Faulting in north-central Kentucky. Bull. Geol. Soc. Am., vol. 27, March, 1916, pp. 101-104. Describes types of faults and mentions the relation between oil formations and monoclinial structure, and between monoclinial structure and faults as shown in known oil pools of the State.

STATISTICS, *see* Nos. 12-19, 21-34; Legal regulations, *see* No. 96.

NEW YORK.

STATISTICS, *see* Nos. 12-19, 21-34.

LEGAL REGULATIONS.

47. NATIONAL PETROLEUM NEWS. State insurance benefit to oil plants. Vol. 8, August, 1916, pp. 24, 26, 28; 30, 32. Discusses benefits to the oil trade of state insurance as tried out in Ohio, New York, and other States. Explains Ohio workmen's compensation act provisions, with advantages to the trade. Rates are given for State of New York and compared with stock company rates of the same State.

OHIO.

GEOLOGY AND ORIGIN.

48. BENNETT, C. A. Anticlines in the Clinton sand near Wooster, Wayne County, Ohio. Bull. 621, U. S. Geol. Survey, 1916, pp. 87-98. Concludes that the accumulation of oil and gas has been largely controlled by the geologic structure. Suggestions are made for prospecting for extensions of known pools.
49. BOWNOCKER, J. A. Natural gas in Ohio. Jour. Cleveland Eng. Soc., vol. 8, March, 1916, pp. 313-326; discussion, pp. 326-332. Gives history of development of oil fields. Describes the Clinton sand and gives logs of representative wells. Discusses geology and origin of natural gas.
50. CONNIT, P. D. Structure of the Berea oil sand in the Summerfield quadrangle, Guernsey, Noble, and Monroe counties, Ohio. Bull. 621, U. S. Geol. Survey, 1916, pp. 217-231. A detailed study of stratigraphy of the region and of the relation of the structure to accumulation of oil and gas. Concludes that new pools can be located only by drilling after study of a structural contour map showing the probable extensions of known fields.
51. ——— Structure of the Berea oil sand in the Woodsfield quadrangle, Belmont, Monroe, Noble, and Guernsey counties, Ohio. Bull. 621, U. S. Geol. Survey, 1916, pp. 233-249. Stratigraphy and geologic structure of the region are described and relation of structure to the accumulation of oil and gas is shown. Structural maps are needed to determine the extension of pools after the first successful wells are drilled.
52. SLATTEER, C. R. Divisions and correlations of the Dunkard series of Ohio. Bull. Geol. Soc. Am., vol. 27, March, 1916, pp. 86-88. Describes formations and fossils.
53. ——— The relationships of the Olentangy shale and associated Devonian deposits of northern Ohio. Jour. Geol., vol. 24, July-Aug., 1916, pp. 476-487. Correlates the Hamilton of Ohio with Devonian deposits of the same age to the north of Lake Erie.
54. STOUT, WILBER. Geology of southern Ohio. Ohio Geol. Survey, 4th ser., Bull. 20, 1916, 723 pp. A study of Jackson and Lawrence counties and of parts of Pike, Scioto and Gallia counties. Discusses search for oil and gas. Describes oil and gas sands, gives accounts of drilling operations, and representative well logs.
55. VERWEIBE, W. A. The Berea formation of Ohio and Pennsylvania. Am. Jour. Sci., 4th ser., vol. 42, July, 1916, pp. 43-58. Reviews early work done in this field. Discusses formations between Crawford County and the Allegheny River, based on paleontology, lithologic character, and stratigraphic position. Sections are given showing measurements, and the oil and gas horizons are described.

See also Nos. 194, 1334.

DEVELOPMENT AND PRODUCTION.

56. CRITCHFIELD, C. V. The Ohio Commission's investigation of the natural gas shortage in Cleveland. Am. Gas Light Jour., vol. 104, Apr. 10, 1916, pp. 230-231. Discusses causes and remedies for shortage.

See also Nos. 482, 499.

STATISTICS, *see* Nos. 12-19, 21-34.

LEGAL REGULATIONS.

57. OIL AND GAS JOURNAL. Gasoline status is legally fixed. Vol. 14, Feb. 10, 1916, p. 30. Decision of Supreme Courts in Ohio and West Virginia is that gasoline is a product of the oil and therefore subject to royalty laws. *See also* Nos. 47, 96.

PENNSYLVANIA.

- GEOLOGY AND ORIGIN, *see* No. 55; Development and production, *see* No. 502; Statistics, *see* Nos. 12-19, 21-34, 58; Legal regulations, *see* No. 96.

MAPS.

59. PENNSYLVANIA TOPOGRAPHIC AND GEOLOGIC SURVEY. Oil and gas map of southwestern Pennsylvania. 1916. Scale 1:250,000. Map shows oil and gas pools and is accompanied by a pamphlet of 22 pp. which gives production statistics of oil and gas; tables show number of oil wells in the State, by counties, 1909 to 1913, and the acreage held for petroleum, 1909 to 1913, by counties; also gives a list of the principal oil and gas pools.

WEST VIRGINIA.

GEOLOGY AND ORIGIN.

59. GRIMSLEY, G. P. Jefferson, Berkeley and Morgan counties. West Virginia Geol. Survey, County Repts., 1916, pp. 603-606, maps. Discusses oil and gas prospects and concludes that conditions are not favorable for drilling.
60. KREBS, C. E., AND TEETS, D. D., JR. Raleigh County and the western portions of Mercer and Summers counties. West Virginia Geol. Survey, County Repts., 1916, pp. 373-379, maps. Gives geology and mineral resources of these areas. Little drilling has been done there.
61. REGER, D. B. Lewis and Gilmer Counties. West Virginia Geol. Survey, County Reports, 1916, pp. 174-499, maps. Describes oil and gas horizons and productive sands. Gives well records for each county and describes prospective areas. Table shows average original rock pressures of different gas-producing sands.
62. ——— The possibility of deep-sand oil and gas in the Appalachian geosyncline of West Virginia. Bull. Am. Inst. Min. Eng., September, 1916, pp. 1709-1724. Gives a geologic description of the region and a table of well records to show deep tests that have been made to find oil below the Catskill series. Suggestions for drilling are given.
- 1 DEVELOPMENT AND PRODUCTION, *see* No. 61. Refining and refineries, *see* No. 920; Statistics, *see* Nos. 12-19, 21-34; Legal regulations, *see* Nos. 57, 96; Maps, *see* Nos. 59-61.

ILLINOIS FIELD.

GEOLOGY AND ORIGIN.

63. BROKAW, A. D. Preliminary oil report on southern Illinois. Ill. State Geol. Survey, Bull. 35, 1916, 13 pp. extract. A geologic study of parts of Saline, Williamson, Pope, and Johnson counties. States relation between geologic structure and oil and gas accumulations. Describes beds to be penetrated in drilling for oil or gas.

64. KAY, F. H. Petroleum in Illinois in 1914 and 1915. Bull. 33, Illinois State Geol. Survey, 1916, pp. 71-90. Shows decline in production since 1911. Gives locations and descriptions of oil and gas wells and records of wells drilled. Describes cementing methods for oil wells, also, new field for casing-head gasoline tests. Value of oil is given.
65. ——— Notes on Bremen anticline—Randolph County. Bull. 33, Illinois State Geol. Survey, 1916, pp. 101-103. Gives brief description of the anticline.
66. RICH, J. L. Oil and gas in the Birds quadrangle. Bull. 33, Illinois State Geol. Survey, 1916, pp. 105-145. Discusses occurrence of oil and gas and structures favoring oil accumulation. Logs of several wells are given, also descriptions of the oil sands and of various pools.
67. ——— Oil and gas in the Vincennes quadrangle. Bull. 33, Illinois State Geol. Survey, 1916, pp. 147-175. A detailed geological study of the region, describing the various formations and the occurrence of oil and gas. Gives results of investigations of new pools developed since 1911. Suggests areas favorable for further drilling.
68. SAVAGE, T. E. Geologic structure of Canton and Avon quadrangles. Bull. 33, Illinois State Geol. Survey, 1916, pp. 91-99. Describes strata penetrated in drilling; gives representative well logs, and diagrams showing the structure of the beds. Discusses oil and gas accumulations.

DEVELOPMENT AND PRODUCTION.

69. KAY, F. H. Petroleum in Illinois in 1914 and 1915. Bull. 33, Illinois State Geol. Survey, 1916, pp. 71-90. Deals with boring operations, by counties; production statistics for the State; discusses cementing process as practical in Illinois; also possibilities for casing-head gasoline manufacture.
- REFINING AND REFINERIES, *see* No. 69; Statistics, *see* Nos. 12-19, 21-34, 69.

MID-CONTINENT FIELD.

GEOLOGY AND ORIGIN.

70. OIL CITY DERRICK. Productive sands of the Mid Continent field. Jan. 14, 1916, pp. 5-6. Gives location of different sands, depth and productiveness of wells in each.

TRANSPORTATION, STORAGE, AND DISTRIBUTION.

71. FEDERAL TRADE COMMISSION. Letter of submittal and summary and conclusions of the report of the Federal Trade Commission on pipe-line transportation of petroleum. Washington, Feb. 28, 1916, 27 pp.
72. ——— Report on pipe-line transportation of petroleum. Washington, Feb. 28, 1916, 467 pp. Report of investigation of the investment in pipe lines and cost of operating, covering the five large interstate lines starting from the Mid-Continent field.
- See also* No. 579.

REFINING AND REFINERIES.

73. JAMES, H. G. Refining conditions in the Mid-Continent field in 1915. Oil and Gas Jour., vol. 14, Jan. 13, 1916, pp. 36-40. Gives figures for gasoline production and fluctuation of prices, and shows growth of refinery industry in 1915.
- STATISTICS, *see* Nos. 12-19, 21-34, 73.

KANSAS.

OCCURRENCE.

- 74.** MOORE, P. T. Kansas in role of chief market maker, or breaker. *Fuel Oil Jour.*, vol. 7, September, 1916, pp. 3-17. Discusses Butler County oil fields, their development, possibilities of new fields, production estimates, the different sands, quality of the oil, market facilities, etc.

DEVELOPMENT AND PRODUCTION.

- 75.** *ELECTRICAL WORLD.* Electricity in the oil fields. Vol. 68, Dec. 30, 1916, pp. 1298-1299. Shows possibilities in Kansas fields for long-hour central station loads in well pumping, pipe-line pumping and oil heating. Gives cost of operation per month for steam and electric water-pumping equipments.
- GEOLOGY AND ORIGIN,** *see* Nos. 74, 111, 318; Legal regulations, *see* No. 96; Statistics, *see* Nos. 2-19, 21-34, 92.

LOUISIANA, NORTHERN.

GEOLOGY AND ORIGIN.

- 76.** MATSON, G. C. The Caddo oil and gas field, Louisiana and Texas. Bull. 619, U. S. Geol. Survey, 1916, 62 pp. Describes geologic structure of the field and occurrence of oil and gas; gives analyses. Contains well logs and geologic and topographic maps.

UTILIZATION.

- 77.** *FUEL OIL JOURNAL.* Texas-Louisiana railroads' consumption of fuel oil in 1915. Vol. 7, February, 1916, pp. 60-62. Gives statistics for the year. Over 11,000,000 barrels of oil were used.

STATISTICS.

PRODUCTION.

- 78.** *Oil Trade Journal.* Monthly statement of production, by districts. *See also* Nos. 12-19, 21-34, 77.

MAPS AND PROPERTIES, *see* No. 76.

OKLAHOMA.

GEOLOGY AND ORIGIN.

- 79.** FATH, A. E. An anticlinal fold near Billings, Noble County, Oklahoma. Bull. 641, U. S. Geol. Survey, 1916, pp. 121-138. The geology of the anticline is described relative to possibilities of oil and gas, which are found about 20 miles from the anticline. Gives well records.
- 80.** HEALD, K. C. The oil and gas geology of the Foraker quadrangle, Osage County, Oklahoma. Bull. 641, U. S. Geol. Survey, 1916, pp. 17-47. Discusses topography, stratigraphy, and structure; also, occurrence and accumulation of oil and gas.
- 80a.** WEGEMANN, C. H. The Duncan gas field, Stephens County, Oklahoma. U. S. Geol. Survey Bull. 621, 1916, pp. 43-59. A study of the stratigraphy and structure of the field and the occurrence of the oil and gas. Gives analyses of gas from this field.

- 80b. ———. Loco gas field, Stephens and Jefferson counties, Oklahoma. U. S. Geol. Survey Bull. 621, 1916, pp. 31-42. Gives history of development of the field, its stratigraphy and structure. Discusses occurrence of the oil and gas and their origin and analyses.
81. ———. Notes on the gas fields of central and southern Oklahoma. Bull. 629, U. S. Geol. Survey, 1916, pp. 121-126. Discusses future supply of gas to Dallas and Fort Worth, Texas. Describes Checotah and Ada gas fields, and pools in Carter and Stephens counties. (See also No. 102.)

See also Nos. 93, 111, 317, 318.

- 81a. WEGEMANN, C. H., AND HEALD, K. C. The Healdton oil field, Carter County, Oklahoma. U. S. Geol. Survey Bull. 621, 1916, pp. 13-30. Bull. 621-B, 1915. Gives a short history of development of field, its location, topography and drainage, stratigraphy and structure, and geologic history. Gives also the sources and occurrence of oil and gas in the field. A table of analyses of the oil shows its refining qualities.
- 81b. ———. The Lawton oil and gas fields, Oklahoma. U. S. Geol. Survey Bul. 621, 1916, pp. 71-85. Presents a geologic study of the field, its stratigraphy, structure, etc., position of the oil sands, origin of the oil and gas. Analysis of the gas is given. Gives occurrences of oil, gas and asphalt in the vicinity of the Wichita Mountains.

DEVELOPMENT AND PRODUCTION.

82. HUNTER, J. L. Healdton oil pool, Oklahoma. Oil and Gas Man's Mag., vol. 11, January, 1916, pp. 309-319. Gives history of early drilling.
83. NATIONAL PETROLEUM NEWS. Claims success for "mudding" in Oklahoma oil fields. Vol. 8, May, 1916, 87-88 pp. Report of conservation committee of the Natural Gas Association of America; discusses advantages of mudding.
84. POLLARD, J. A. Use of rotary system in Blackwell field, Oklahoma. Oil and Gas Jour., vol. 14, March 30, 1916, p. 27. Gives advantages of the rotary over the circulator system.
85. SARCHET, C. M. New methods of conservation. Nat. Gas Jour., vol. 10, February, 1916, pp. 73-74. Describes several drilling methods used in the Shainrock and Blackwell fields, Oklahoma. Explains advantages of the mudding or lubricating system. With the circulator system a string of casing over a thousand feet long can be carried. The rotary system enables the gas sands to be shut in and although requiring more men permits quicker drilling and saves money.

See also Nos. 340, 478, 491.

TRANSPORTATION, STORAGE, AND DISTRIBUTION.

86. OIL AND GAS JOURNAL. Pipe-line construction in Oklahoma in 1915. Vol. 14, January 13, 1916, pp. 43-44. Gives miles of line laid in different fields. Table shows miles laid by each company during 1915.
87. ———. Steel storage built in Oklahoma. Vol. 14, Jan. 13, 1916, p. 63. Gives cost of a tank and list of companies in Oklahoma owning steel storage of 55,000-bbl. capacity.
88. SARCHET, C. M. Concrete tanks for storing oil, replacing steel in Oklahoma. Manufac. Rec., vol. 70, Nov. 2, 1916, p. 65. Concrete tanks reduce rates on insurance. Cost of building steel tanks is given; also storage statistics and value of the oil in the Mid-Continent field.

See also Nos. 100, 552, 615.

REFINING AND REFINERIES.

89. FUEL OIL JOURNAL. List of casing head gasoline plants in Oklahoma, with their approximate daily output in gallons. Vol. 7, February, 1916 p. 132.
 90. JAMES, H. G. Oklahoma leads in casing head gasoline. Oil and Gas Jour., vol. 14, Feb. 24, 1916, pp. 27-28. Statistical review of the industry in Oklahoma.
 91. WHITNEY, R. H. Increasing value of casing head gasoline. Oil and Gas Jour., vol. 14, May 11, 1916, pp. 28, 34. Reviews growth of the industry in Oklahoma and gives statistics of cost, production, etc.
- PROPERTIES AND THEIR DETERMINATION, *see* No. 478.

STATISTICS.

92. MOORE, P. T. Oklahoma the market-maker. Fuel Oil Jour., vol. 7, February, 1916, pp. 3-5, 8-9, 12-13. A statistical review of production in the Oklahoma and Kansas oil fields.
 93. SHANNON, C. W. Handbook on the natural resources of Oklahoma. Okla. Geol. Survey, Sept., 1916, 96 pp. Reviews the geology of the State and gives general information concerning the natural resources, including asphalt, natural gas and petroleum. Statistics of production are also given.
- See also* Nos. 12-19, 21-24, 89-91.

LEGAL REGULATIONS.

94. OKLAHOMA CORPORATION COMMISSION. Eighth and ninth annual reports for the years ending June 30, 1915 and June 30, 1916. Oklahoma City, 1916, 490 pp. Reviews the work of the Commission in the conservation of oil and gas in the State and contains orders issued in regard to oil and gas.
 95. MANNING, V. H. Conservation of natural gas. Proc. Nat. Gas Assoc. Am., vol. 8, 1916, pp. 72-80; discussion, pp. 80-82; Nat. Gas Jour., vol. 10, June, 1916, pp. 225-229. Summarizes the work of the U. S. Bureau of Mines in the conservation of natural gas, particularly in Oklahoma, and of the resulting legislation in Oklahoma toward this end.
 96. OIL AND GAS JOURNAL. Oil tax laws of Oklahoma denounced. Vol. 15, Oct. 26, 1916, p. 28. A protest against existing laws in Oklahoma and brief statements of the oil tax methods of Indiana, Kentucky, Ohio, Pennsylvania, West Virginia, Kansas, Texas, California, and Wyoming.
 97. UNITED STATES CONGRESS, SENATE, COMMITTEE ON INDIAN AFFAIRS. Oil lands in the Osage Reservation. 64th Cong., 1st sess., Rept. No. 164, Feb. 23, 1916, 59 pp. Reports a Senate resolution requesting the Secretary of the Interior to refrain from action on the disposition of certain Osage lands for a period of two years, and authorizing an investigation of the subject of leasing such lands. Contains regulations governing the leasing of Osage lands for oil and mining purposes, approved Aug. 26, 1915, reports of conferences on the subject with the Osage tribal council, etc.
 98. UNITED STATES OFFICE OF INDIAN AFFAIRS. Regulations to govern oil and gas operations on restricted Indian lands in Oklahoma, approved Oct. 20, 1915, and amended Mar. 15, 1916. Washington, 1916, 8 pp.
- See also* No. 491.

TEXAS, EASTERN AND NORTHEASTERN.

GEOLOGY AND ORIGIN.

99. DUMBLE, E. T. The geology of Texas. The Rice Institute Pamphlet, vol. 3, Apr., 1916, pp. 125-204. Discusses geologic history of the State and the

- uniformity of Texas formations with those of other regions, character and extent of deposits, and the geographic and geologic occurrence of materials of economic value, including oil, gas, asphalt, and shale.
100. MATSON, G. C. Gas prospects south and southeast of Dallas. Bull. 629, U. S. Geol. Survey, 1916, pp. 77-110. Gives a geological study of the region in order to determine the quantity of gas available for the future use of the city. General statements are made as to the occurrence, pressure, and accumulation of natural gas, and a detailed account of its occurrence in the Mexia-Groesbeck field is given. Discusses probable future capacity of the field and the probable opening of new producing sands near by. Numerous well logs, charts, etc., are also given. (See also No. 102.)
 191. SHAW, E. W. Gas in the area north and west of Fort Worth. Bull. 629, U. S. Geol. Survey, 1916, pp. 15-75. Describes geography, stratigraphy, and geological structure of region and also of the Petrolia field in detail. Conditions favorable for the finding of new pools are given, also numerous well logs. Conclusions are drawn as to capacity of the field in the future and suggestions made as to how the capacity may be increased.
 102. SHAW, E. W., MATSON, G. C., AND WEGEMANN, C. H. Natural gas resources of parts of north Texas. Bull. 629, U. S. Geol. Survey, 1916, 126 pp. Gives results of an investigation to determine the sufficiency and prospective duration of the gas reserves of the cities of Dallas and Fort Worth. (See also Nos. 81, 100, 101.)
 103. UDDEN, J. A., BAKER, C. L., AND BÜSE, EMIL. Review of the geology of Texas. Univ. Texas Bull. 44, 1916, 153 pp. Describes in detail the physiography and geology of the State, and gives its geologic history. Describes, also, the economic minerals and the occurrence of oil, gas and asphalt.
 104. UDDEN, J. A., AND BYBEE, H. P. The Thrall oil field. Univ. Texas Bull. 66, 1916, pp. 7-78. Gives a detailed geological study of the region, also analyses of the oil and statistics of production. Describes difficulties caused by the presence of paraffin in the wells. An appendix contains detailed well data. (See also Nos. 107, 108.)

See also Nos. 76, 81.

- 104a. WEGEMANN, C. H. A reconnaissance in Palo Pinto County, Texas, with special reference to oil and gas. U. S. Geol. Survey Bull. 621, 1916, pp. 51-59. Results of investigation to determine whether anticlines existed which might have influenced the accumulation of oil, and to discover areas where drilling might be successful. Studies topography, stratigraphy, and structure of the region.
- 104b. ——— A reconnaissance for oil near Quanah, Hardeman County, Texas. U. S. Geol. Survey Bull. 621, 1916, pp. 109-115. Gives results of examination of this area to determine geologic structure and the presence or absence of anticlines which might be effective in producing oil or gas accumulations. No definite conclusion reached as to whether oil is present in commercially paying quantities, though the structure seems favorable.

DEVELOPMENT AND PRODUCTION.

105. RITCHIE, N. E. Texas gas should be conserved. Oil and Gas Jour., vol. 14, Jan. 27, 1916, p. 28. Discusses urgent need for law to prevent waste. Gives causes of waste and how to avert them.

TRANSPORTATION, STORAGE, AND DISTRIBUTION.

106. WELCH, W. M. Natural gas resources and supplies (north Texas and southern Oklahoma). Nat. Gas. Jour., vol. 10, May, 1916, pp. 187-194.

Results of cooperative investigation by the Bureau of Mines and the cities of Dallas and Fort Worth relative to deposits of natural gas. Discusses means required to deliver supply from the field to the two cities. Report also discusses present and future demands and pipe line facilities, and the adequacy of present or possible future sources of supply.

PROPERTIES AND THEIR DETERMINATION.

107. SCHUCH, E. P. Ozokerite from the Thrall oil field. Univ. Texas Bull. 66, 1916, pp. 79-81. Gives results of an examination of the waxy material obtained with the petroleum of this field, proving it to be fine ozokerite, free from paraffin. (*See also* No. 101.)
108. SCHUCH, E. P., AND READ, W. T. The chemical composition of the petroleum obtained at Thrall, Tex. Univ. Texas Bull. 66, 1916, pp. 83-88. Gives results of examination of seven samples of Thrall oil, and briefly considers other Texas oils as reported by previous investigators. (*See also* No. 104.)
- See also* No. 76.

UTILIZATION.

109. BURDICK, R. H. Performance of Diesel-engine plants in Texas. Elec. World, vol. 67, Mar. 11, 1916, pp. 587-592. Discusses fuel and lubricating oil requirements, and engine maintenance. Gives costs and other operating data for eight stations.
- See also* No. 77.

STATISTICS.

PRODUCTION.

110. Oil Trade Journal. Monthly statement of production, by districts. *See also* Nos. 12-19, 21-34, 77.
- LEGAL REGULATIONS, *see* No. 493; Maps, *see* No. 76.

NEBRASKA.

GEOLOGY AND ORIGIN.

111. BARBOUR, E. H. The natural fuels of Nebraska. Nebraska Geol. Survey, vol. 4, pt. 25, 1916, 7 pp. Discusses oil and gas prospects of the southeastern part of the State where the structure is in continuity with that of the oil fields of Oklahoma and Kansas.

IOWA.

UTILIZATION.

112. WAGNER, H. W. A study of oil engines in Iowa power plants. Iowa State College of Agric. and Mech. Arts, Eng. Exper. Sta. Bull. 42, 1916, 159 pp. Gives results of tests of engines in electric light and power plants relative to fuel consumption. Statistics are given, including cost data for various types of engines.

GULF COAST FIELD.

OCCURRENCE.

113. WILSON, L. M. Petroleum and natural gas; a short treatise on their early history, origin, distribution, accumulation, and surface conditions. Houston, Texas, 1916, 64 pp. Relates especially to the Gulf Coast country. *See also* 214b.

GEOLOGY AND ORIGIN.

114. MOORE, W. C. Indications of oil in the Gulf Coast country; what they are and how to know them. Houston, Texas, 1916, 12 pp. Explains various surface indications of oil and gives information as to location, surface and underground conditions of the present known fields.

See also No. 113.

PROPERTIES AND THEIR DETERMINATION.

115. HEYNE, H. R. Comparison of Gulf Coast lubricating oils with paraffine base lubricants. Fuel Oil Jour., vol. 7, Feb., 1916, pp. 140-142. Discusses viscosity and its importance in lubrication. Gives practical tests of these oils as to their lubricating efficiency, internal combustion engine lubrication, their flash points, cold tests, chemical properties, etc.

STATISTICS *see* Nos. 12-19, 21-34.

LOUISIANA, COASTAL.

REFINING AND REFINERIES.

116. SMITH, C. E. "Mexpet" refinery at Destrehan, Louisiana. Pan-American Rec., vol. 1, September, 1916, pp. 10-12; October, 1916, pp. 13-14; November, 1916, pp. 13-14. Gives general description of the plant and its construction.

STATISTICS.

FIELD DEVELOPMENT AND PRODUCTION.

117. Oil Trade Journal. Monthly statement of production, by districts, and Gulf Coast drilling operations.

LIST OF NEW INCORPORATIONS.

118. Fuel Oil Journal. Monthly list of new oil and gas companies.

See also Nos. 12-19, 21-34.

UTILIZATION, *see* No. 77.

TEXAS, COASTAL.

DEVELOPMENT AND PRODUCTION.

119. HAZETT, A. J. Ingenious method used to extinguish burning gusher at Humble, Texas. Fuel Oil Jour., vol. 7, March, 1916, pp. 78-79. Tells how a pit 75 feet in diameter was dug 100 feet from the burning well and the burning oil was driven by steam and water into this pit through a section of smoke stack and a ditch 4 feet wide, roofed with corrugated iron and covered with dirt.

See also No. 105.

TRANSPORTATION, STORAGE, AND DISTRIBUTION.

120. SAFETY ENGINEERING. Gasoline tank fire. Vol. 32, Sept., 1916, pp. 140-144. Gives data on burning and extinguishing of gasoline tanks of Gulf Refining Co., at Port Arthur, Tex., July 19, 1916.

STATISTICS.

FIELD DEVELOPMENT AND PRODUCTION.

121. Oil Trade Journal. Monthly statement of production, by districts, and the Gulf Coast drilling operations.

See also Nos. 12-19, 21-34, 77.

GEOLOGY AND ORIGIN, *see* Nos. 99, 103; Occurrence, *see* No. 99; Utilization, *see* No. 77; Legal regulations, *see* no. 493.

ROCKY MOUNTAIN FIELD.

COLORADO.

OCCURRENCE.

122. DEBEQUE, G. R. The bituminous shale industry in northwestern Colorado. Eng. and Min. Jour., vol. 102, Dec. 9, 1916, pp. 1011-1012. Gives extent of the Colorado oil-shale area, occurrence of the shale, its properties and possibilities.

GEOLOGY AND ORIGIN.

123. DAVIS, C. A. Some fossil algae from the oil-yielding shales of the Green River formation of Colorado and Utah. Proc. Nat. Acad. Sci., vol. 2, Mar. 15, 1916, pp. 114-119. Bull. Geol. Soc. Am., vol. 27, March, 1916, pp. 159-160, abstract. Gives results of a microscopic examination of the oil shales.
124. WINCHESTER, D. E. Oil shale in northwestern Colorado and adjacent areas. Bull. 641-F, U. S. Geol. Survey, 1916, 60 pp. Describes geologic structure of the region. Gives tests to show oil obtainable from the shale. Describes apparatus used, and gives tabulation of results.

See also No. 122.

PROPERTIES, *see* Nos. 122, 124; Statistics, *see* Nos. 12-19, 21-34.

MONTANA.

GEOLOGY AND ORIGIN.

125. BOWEN, C. F. Possibilities of oil in the Pocupine dome, Rosebud County, Montana. Bull. 621, U. S. Geol. Survey, 1916, pp. 61-70. Gives a detailed geologic study of the region. Systematic drilling necessary to show presence of oil and gas.
126. CALVERT, W. R. Geology of the Upper Stillwater Basin, Stillwater and Carbon Counties, Montana, with special reference to coal and oil. Bull. 641, U. S. Geol. Survey, 1916, pp. 199-214. Gives geologic study of the region, its stratigraphy and structure, and prospects for finding oil.
127. STEINGER, EUGENE. Possibilities of oil and gas in north-central Montana. Bull. 641, U. S. Geol. Survey, 1916, pp. 49-91. Reviews the geologic structure; formations similar to those of nearby fields.

UTAH.

OCCURRENCE.

128. HIGGINS, W. C. The ozokerite deposits of Soldier Summit, Utah. Salt Lake Min. Rev., vol. 18, Sept. 30, 1916, pp. 15-18. Gives properties and

- uses of ozokerite as found in Utah, and of its refined product, ceresin. Describes its mode of occurrence and development of the field.
129. HOWARD, L. O. Ozokerite in Utah. *Min. and Sci. Press*, vol. 112, June 17, 1916, pp. 907-911. Describes deposits in Galicia and Utah. Gives methods of purification, properties, and uses of ozokerite products.
 130. IRELAND, J. B. Oil shale industry planned for Utah. *Salt Lake Min. Rev.*, vol. 17, March 30, 1916, pp. 14-15. Shale beds are situated in north-eastern Utah and northwestern Colorado. Discusses value of distillation products of shale, including gas and ammonia. Describes John D. Scott process of distilling oil from shale. The retort has three chambers, the preheater, the eduction, and the cooling. Each chamber contains 10 trays with perforated bottoms, 6 inches apart, one above the other. Loading and moving of trays is done by machinery. Treatment requires 4½ hours. Cost is given.
 131. ROBINSON, H. M. Ozokerite in central Utah. *Bull. 641, U. S. Geol. Survey*, 1916, pp. 1-16. Gives location, history, and geology of the field, also, composition, properties, mining, and uses of the material.

UTILIZATION.

132. PALMER, ELIHU. Recent uses of Utah elaterite. *Eng. and Min. Jour.*, vol. 102, Nov. 11, 1916, p. 856. Elaterite or "mineral rubber" is used in solution as a poreless, waterproof veneer for wood, iron, steel, tin, leather, rubber, cork, concrete, and other substances.
- See also Nos. 128, 129, 131.*

GEOLOGY AND ORIGIN, *see Nos. 123, 124, 128, 129, 131*; Properties, *see Nos. 124, 128, 129, 131*; Refining and refineries, *see Nos. 129-131.*

WYOMING.

OCCURRENCE.

133. HERRICK, J. P. Pilot Butte Dome appears promising. *Oil and Gas Jour.*, vol. 15, Sept. 14, 1916, p. 32. Reviews field developments in Wyoming district.
134. LUTON, C. T. Oil and gas near Basin, Big Horn County, Wyoming. *Bull. 621, U. S. Geol. Survey*, 1916, pp. 157-190. Gives history of field from the first discovery of oil in 1884. Presents stratigraphy and structure in detail, location of oil and gas wells, analyses of oil, and logs of several wells.
135. OIL AND GAS JOURNAL. Past history of oil in the State of Wyoming. Vol. 15, Nov. 16, 1916, pp. 26, 31. Short account of the discovery of oil in the State.

GEOLOGY AND ORIGIN.

136. CONBIT, D. D. Relations of the Embar and Chugwater formations in central Wyoming. *Prof. Paper 98, U. S. Geol. Survey*, 1916, pp. 263-270. Gives detailed geologic description of the Embar formation in which petroleum has been found in the Wind River basin.
137. DARTON, N. H. Sedimentary rocks (of the North Laramie Mountains, Wyoming). *Bull. 626, U. S. Geol. Survey*, 1916, pp. 53-56. Gives a detailed geologic description.
138. HARRIS, C. J. Anticlines in central Wyoming. *Bull. 641, U. S. Geol. Survey*, 1916, pp. 223-279. Results of a detailed study of the formations of this region, its folds and domes, to ascertain the possibilities of oil and gas. Conclusion is that there are favorable conditions for the accumulation of oil and gas and that thorough prospecting has not been made.

- 138a. ——— Stratigraphic relations of some of the Cretaceous and Tertiary formations of the Hanna and Powder River basins with those of the Wind River basin. *Jour. Wash. Acad. Sci.*, vol. 6, May 4, 1916, pp. 255-256 (Abstract).
139. HERRICK, J. P. Description of the Salt Creek oil field, Wyoming. *Oil and Gas Jour.*, vol. 15, Aug. 31, 1916, pp. 25-26. Describes geologic structure, occurrence of the oil, development, working conditions, storage facilities, etc.
140. JOHNSON, A. A. Wyoming as an oil state. *Oil and Gas Jour.*, vol. 15, Dec. 7, 1916, p. 30. A short review of the geological characteristics of the State and prediction of great oil development there.
141. LURTON, C. T. Notes on the stratigraphic and structural relations in southern and eastern Bighorn Basin, Wyoming. *Jour. Wash. Acad. Sci.*, vol. 6, May 19, 1916, pp. 310-311, abstract. Points out prominent features.
142. TRUMBULL, L. W. The effect of structures upon the migration and separation of hydrocarbons. *Bull. 1, Wyoming Geol. Survey Sci. ser.*, 1916, pt. 2, 11 pp. Describes in tabular form the structure of the various Wyoming fields. Also, discusses the formation of domes containing oil or gas, applying the theories formed to some of the domes of the State.
143. ——— The light oil fields of Wyoming. *Bull. 12, Wyoming Geol. Survey*, 1916, 2nd ed., 12 pp. Discusses the light oils found in Cretaceous strata. Gives list of these fields, their structure, etc. Also gives depth to the most productive sand in the more important fields. The quality of the oil and possibilities of new fields are discussed.
144. ——— Petroleum in granite. *Bull. 1, Wyoming Geol. Survey Sci. ser.*, 1916, Pt. 1, 16 pp. Describes an occurrence of petroleum in granite and associated crystalline rocks in the central part of Wyoming, and gives an explanation based on the geologic history of the region.
145. WEGEMANN, C. H. The discovery of Wasatch fossils in the so-called Fort Union beds of Powder River Basin, Wyoming, and its bearing on the stratigraphy of the region. *Jour. Wash. Acad. Sci.*, vol. 6, May 4, 1916, pp. 254-255, abstract.
146. ZIEGLER, VICTOR. The Pilot Butte oil field. *Bull. 13, Wyoming Geol. Survey*, 1916, 39 pp. Gives a detailed geologic study of the field. Describes oil wells and discusses future prospects, which are considered good.
- See also Nos. 124, 134.*

DEVELOPMENT AND PRODUCTION, *see* No. 139; Transportation, etc., *see* No. 139; Properties, *see* Nos. 134, 143, 146; Statistics, *see* Nos. 12-19, 21-34; Legal regulations, *see* No. 96.

ARIZONA.

UTILIZATION.

147. ENSIGN, O. H. Hydroelectric irrigation in Arizona. *Jour. Elec. Power and Gas*, vol. 36, Feb. 5, 1916, pp. 105-108. Contains cost figures and comparisons of hydroelectric, steam, oil and gas power.
- See also No. 985.*

PACIFIC COAST FIELD.

CALIFORNIA.

GEOLOGY AND ORIGIN.

148. DICKERSON, R. E. Stratigraphy and fauna of the Tejon Eocene of California. *California Univ. Dept. of Geology, Bull.*, vol. 9, May 2, 1916, pp. 303-524.

149. ENGLISH, W. A. Geology and oil prospects of Cuyama Valley, California. Bull. 621, U. S. Geol. Survey, 1916, pp. 191-215; Jour. Wash. Acad. Sci., vol. 6, June 19, 1916, pp. 400-401, abstract. Results of an investigation to determine the most probable places for finding oil. Studies in detail the stratigraphy and structure. Reviews known productive fields nearby and states conditions in the Cuyama Valley.
 150. MARTIN, BRUCE. The Pliocene of middle and northern California. California Univ. Dept. of Geology, Bull., vol. 9, Feb. 29, 1916, pp. 215-219. Includes description of the Merced and the Echehoin of the Sargent oil field.
 151. PACK, R. W. Structural features of the San Joaquin Valley oil fields, California. Jour. Wash. Acad. Sci., vol. 6, May 19, 1916, pp. 309-310, abstract. Enumerates features governing occurrence of oil and shows how they are present in productive fields on the west side of the San Joaquin Valley. Discusses sealing of sandy beds by tar, thus preventing escape of the oil.
 152. SMITH, J. P. The geologic formations of California, with reconnaissance geologic map. Bull. 72, California State Min. Bureau, 1916, 41 pp. A report of progress in geologic study of California during the past 25 years, summarized in map form. Discusses the geologic record of California and the rock-forming agencies, and gives tables and a detailed description of the various geologic formations and geologic map.
- See also* Nos. 315, 331.

DEVELOPMENT AND PRODUCTION.

153. ALLISON, L. R. W. Electric operation of oil properties. Elec. World, vol. 67, Jan. 29, 1916, p. 261. Gives short account of the use of electricity in the Kern River oil fields, California, for pumping from a central power station.
 154. COX, THOMAS. Methods and costs of producing crude petroleum in California. West. Eng., vol. 7, September, 1916, pp. 347-353. Tables and charts show costs of production, using different methods of pumping.
 155. LOMBARDI, M. E. The cost of maintaining production in California oil fields. Trans. Am. Inst. Min. Eng., vol. 52, 1916, pp. 218-223; discussion, pp. 223-224. Gives cost factors in drilling new wells; also, cost per barrel of daily production.
 156. McLAUGHLIN, R. P. Protecting California oil fields from damage by infiltrating water. Trans. Am. Inst. Min. Eng., vol. 52, 1916, pp. 225-231; discussion, pp. 231-238. Discusses the character of California sands and the necessity for special care in water exclusion. Describes methods of protection and gives sketch of bottoms of four wells, illustrating methods. Outlines laws regulating repairs of wells.
 157. ———. Protecting oil fields from infiltrating water. California Derrick, vol. 9, February, 1916, pp. 3-5. Gives examples of financial loss caused by infiltrating water. Sketches of the bottoms of four wells show underground conditions in the Coalinga field. Explains purpose of State legislation of 1915 regulating oil and gas development.
 158. WESTERN ENGINEERING. Natural gas from artesian wells in California. Vol. 7, Feb., 1916, p. 65. Gives description of wells in the vicinity of Stockton, Cal.
- See also* Nos. 415, 416, 478.

TRANSPORTATION, STORAGE, AND DISTRIBUTION.

159. ALLISON, L. R. W. Gas-burning furnaces for oil wells. Gas Age, vol. 37, Apr. 1, 1916, p. 412. Describes a furnace in the California oil fields;

gas obtained from the oil wells: furnace is used for heating the oil so that it may be readily handled on its way to storage reservoir.

160. BOWIE, C. P. Oil pipe-line systems in California. *West. Eng.*, vol. 7, Apr., 1916, pp. 153-155. Gives history of development of pipe lines in the State, and construction and operating details of lines in use.
161. COLE, E. D. Concrete-lined oil-storage reservoirs in California. *Trans. Am. Soc. Civ. Eng.*, vol. 80, 1916, pp. 691-714; discussion, pp. 715-722. Describes the construction of these reservoirs in the California oil fields and the methods used to obtain safe and economical results. Also gives the total cost of storage per barrel of capacity.
162. ROALFE, G. D. Storing and measuring oil from a California gusher. *Eng. News*, vol. 76, Dec. 7, 1916, pp. 1066-1068. Describes how old reservoirs were put to use for storing oil from a gusher and how the oil was measured in order to settle rentals.

See also No. 549, 614.

PROPERTIES AND THEIR DETERMINATION.

163. OIL AGE. Los Angeles city specifications for oils. Vol. 12, Aug., 1916, p. 32. Gives requirements for gasoline and benzine, also, engine, stove, and furnace distillates.

See also No. 478.

REFINING AND REFINERIES.

164. CALIFORNIA OIL WORLD. Refineries in southern California. Sept. 16, 1916, p. 3. Gives list of refineries, their location and daily capacity, and notes special products made by each.
- 164a. BELL, A. F. L. Important topping plants in California. *Trans. Am. Inst. Min. Eng.*, vol. 52, 1916, pp. 185-216; discussion, pp. 216-217. Gives detailed account of plants, with illustrations, and statistical data.

UTILIZATION.

- 164b. ADAMS, W. H. The Diesel engine and its application in southern California. *Trans. Am. Soc. Min. Eng.*, 1915, pp. 447-466; discussion, pp. 466-476. Discusses design, operation, fuels, and costs.
- See also* Nos. 176, 917.

STATISTICS.

DIRECTORIES.

165. Oil, Bradstreet and Mining Directory. Los Angeles, vol. 7, 1916. Gives data on oil companies of California.

FIELD DEVELOPMENT AND PRODUCTION.

166. California State Mining Bureau. Annual report of the mineral production of the State gives production of asphalt, natural gas and petroleum. Annual report of the State oil and gas supervisor gives daily and monthly production of petroleum.
167. California State Mining Bureau. Weekly press bulletins give detailed reports of drilling operations in the State. Annual Reports of the State oil and gas supervisor give details of development. Annual Report of the mineral production of the State gives well operations, by fields and by months.
168. Oil Age. Monthly statement, by fields, with daily average production.
169. Standard Oil Bulletin. Table showing the total production of crude oil in California from the beginning of the industry to 1916, by fields. Vol. 4, June, 1916, p. 12. Total production 851,260,420 bbls.

See also Nos. 12-19, 21-34, 154, 164.

GENERAL INFORMATION.

170. California Derrick. Importance of California's oil industry. Vol. 9, Jan., 1916, pp. 3-4. Statistical summary of conditions in California. Gives acreage, wells, daily average production and shipment, surplus at end of 1914; also total investment, value of oil, cost of equipment and operating, etc. Compares petroleum production with other industries of the State.
171. California State Mining Bureau. Report XIV of the State Mineralogist; mines and mineral resources of portions of California; chapters of the State Mineralogist's report, biennial period 1913-1914. Sacramento, 1916, 974 pp. Contains statistics and general information in regard to oil and gas in several counties.

LIST OF NEW INCORPORATIONS.

172. Oil Age. Monthly statement shows new companies.

PRICES.

173. Oil Age. Monthly statement gives prices of all grades of crude oil, by fields; also gives monthly statement of prices in Los Angeles of refined products of petroleum.
174. Oil Trade Journal. Monthly statement gives prices, by fields.

GENERAL REVIEW OF THE INDUSTRY.

175. BERKLEY, J. M. Natural gas development in southern California. *Gas Age*, vol. 37, May 15, 1916, pp. 573-577. Reviews gas developments and future possibilities on the Pacific Coast.
176. HAMILTON, W. R. The California gasoline industry. *Am. Inst. Min. Eng., Bull.* 114, June, 1916, pp. 1073-1077. Reviews the gasoline industry and briefly discusses outlook for increased production. Discusses the Rittman, Burton, Snelling, McAfee, and other cracking processes.
- UTILIZATION. *see* Nos. 962, 995, 1307, 1318; Legal regulations, *see* Nos. 96, 157, 962; Maps, *see* No. 152.

WASHINGTON.

GEOLOGY AND ORIGIN.

177. WEAVER, C. E. The possible occurrence of oil and gas fields in Washington. *Trans. Am. Inst. Min. Eng.*, vol. 52, 1916, pp. 239-247; discussion, pp. 247-249. Concludes that prospects for occurrences of petroleum are unfavorable owing to geologic conditions.
- 177a. ———. Post-Eocene formations of western Washington. *Proc. California Acad. Sci.*, 4th ser., vol. 6, May 6, 1916, pp. 19-40. Geological and faunal studies.
178. ———. The Tertiary formations of western Washington. *Washington Geol. Survey Bull.* 13, 1916, 327 pp. Describes possible occurrences of petroleum in this part of the State, also, the formations and geologic conditions in various sections. Records drilling operations already carried on.

OTHER FIELDS.

GEOLOGY AND ORIGIN.

179. CHIPSEY, C. E. Do magnetic disturbances indicate oil in Florida, Alabama and Mississippi? *Manufac. Rec.*, vol. 69, March 23, 1916, p. 48. Discusses the relation between the behavior of the compass needle and the distribution of petroleum deposits. Deductions are made concerning the possible oil fields of Florida, southern Alabama, and Mississippi.

180. ——— Possibilities of finding oil in the southeastern Gulf Coast section. *Manufac. Rec.*, vol. 70, Dec. 28, 1916, p. 48. Discusses the relation of magnetic disturbances to oil occurrences.
181. HOPKINS, O. B. Structure of the Vicksburg-Jackson area, Mississippi, with special reference to oil and gas. *Bull.* 644-D, U. S. Geol. Survey, 1916, 28 pp. Gives a geological review of the area, and the possibilities of oil and gas. Suggestions are made relative to prospecting and drilling.

GENERAL REVIEW.

182. NORTROP, J. D. Petroleum and natural gas in the South as chemical resources. *Manufac. Rec.*, vol. 70, Sept., 1916, pp. 89-91. Reviews the progress of petroleum and natural gas industries in the South and gives results of chemical research in these lines.

ALASKA.

OCCURRENCE.

- 182a. BROOKS, A. H. The petroleum fields of Alaska. *Trans. Am. Inst. Min. Eng.*, vol. 51, 1916, pp. 611-619. Describes progress in various fields and character of oil.

STATISTICS.

IMPORTS.

183. United States Bureau of Foreign and Domestic Commerce. Monthly summary of foreign commerce of the United States. Shows quantity and value of crude and refined oils shipped from the United States to Alaska, by kinds of oil.

TENNESSEE.

GEOLOGY AND ORIGIN.

184. BUTTS, CHARLES. Structure of the southern part of Cumberland County, Tennessee, in relation to the possible occurrence of oil and gas. *Resources of Tenn.*, vol. 6, Apr., 1916, pp. 107-110. Concludes that indications of the occurrence of oil and gas are distinctly unfavorable.
185. PURDUE, A. H. Oil and gas conditions in the Central Basin of Tennessee. *Resources of Tenn.*, vol. 6, Jan., 1916, pp. 3-16. Discusses the conditions necessary for an accumulation of oil and gas. The geologic structure of the Central Basin is described. Concludes that oil can not be found in large amounts, and gas only in quantities for private use.
186. ——— Oil and gas in the Reelfoot Lake district of Tennessee. *Resources of Tenn.*, vol. 6, Jan., 1916, pp. 17-36. The main facts of the geology of the Gulf States are reviewed, and the structure of the Reelfoot district is given. Concludes that conditions are favorable for finding oil in paying quantities, and makes suggestions for future prospecting.

CANADA.

OCCURRENCE.

187. OIL AND GAS JOURNAL. Oil shales in Canada. Vol. 14, Apr. 27, 1916, p. 22. Gives geographical occurrence and history of development of oil shale industry in New Brunswick, Nova Scotia, and Quebec.

188. PETROLEUM REVIEW. The possibilities of oil and gas in Nova Scotia, Vol. 35, Sept. 30, 1916, pp. 267-269. Gives localities where there are favorable formations for oil and gas; also gives geologic occurrence, characteristics, and analyses of shales.
 189. SIMPSON, LOUIS. Oil-bearing shales. Bull. Canadian Min. Inst., Oct., 1916, pp. 868-873. Considers the shale resources of Canada and problems connected with the economical mining and working of the shale.
 190. SEANSFIELD, JOHN. The Petrolia oil field, Ontario. Trans. Canadian Min. Inst., vol. 19, 1916, pp. 371-398. Gives location of the field, the history of its development and its geology. Describes drilling, producing, and storing methods used and the characteristics of the oil.
 191. WRIGHT, W. J. Moncton map area, New Brunswick, Canada, Geol. Survey Summ. Rept. for 1915. 1916, pp. 179-185. Describes occurrences of oil, gas and shale.
- See also* Nos. 4, 262.

GEOLOGY AND ORIGIN.

192. BOSWORTH, T. O. The gas fields of Alberta. Petroleum World, vol. 13, April, 1916, pp. 163-167. Gives geologic occurrence, recent developments, and facts about numerous wells in the following regions: the Sweetgrass anticline of southeastern Alberta; the Battle River anticline of eastern Alberta; the foothill region of southwestern Alberta; and the Athabaska monocline of northern Alberta.
193. CUNNINGHAM-CAIG, E. H. The lessons of the Calgary field. Petroleum World, vol. 13, April, 1916, p. 168. Discusses the folly of booming this field, which has not been thoroughly prospected. Attributes failures to a geologic cause, namely, the lack of sufficiently thick and porous reservoir rocks.
- 193a. DOWLING, D. B. Correlation and geological structure of the Alberta oil fields. Trans. Am. Inst. Min. Eng., vol. 52, 1916, pp. 353-362. Detailed descriptions of geology, with map.
194. FOERSTE, A. F. Upper Ordovician formations in Ontario and Quebec. Memoir 83, Canada, Geol. Survey, 1916, 279 pp. Studies extent to which it is possible to discover the elements of the Lorraine faunas of New York and of the Cincinnati faunas of Ohio, Indiana and Kentucky in the Upper Ordovician of Ontario and Quebec.
- 194a. HUNTLEY, L. G. Oil, gas and water content of Dakota sandstone in Canada and United States. Trans. Am. Inst. Min. Eng., vol. 52, 1916, pp. 329-349; discussion, pp. 350-352.
195. KINDLE, E. M. The Ordovician limestones of the Kingston area. Ann. Rept., Ontario Bureau of Mines, vol. 25, 1916, pt. 3, pp. 37-44. Discusses general stratigraphic relations in this area and gives table of Ordovician stratigraphy. Reviews contributions of earlier writers to the subdivision and nomenclature of the Paleozoic rocks of the district.
196. MAC KENZIE, J. D. Geology of a portion of the Flathead coal area, British Columbia. Memoir 87, Canada, Geol. Survey, 1916, 49 pp. Describes impregnations of yellowish, brownish and black materials thought to be residues from the evaporation of petroleum. States that some indications of oil are present and some prospecting has been done, but that the chances for commercial deposits are slight.
197. —. Geology of Graham Island, British Columbia. Memoir 88, Canada, Geol. Survey, 1916, 207 pp. Discusses the origin and accumulation of petroleum deposits of commercial value. Discusses, also, the oil-shale possibilities of the region.
198. McLEARN, F. H. Jurassic and Cretaceous, Crowsnest Pass, Alberta. Canada, Geol. Survey Summ. Rept. for 1915. 1916, pp. 110-112.

199. MALCOLM, WYATT. Bibliography of Canadian geology for 1914. Trans. Roy. Soc. Canada, 3rd ser., vol. 9, sec. 4, 1915. 1916, pp. 279-305. References arranged by authors.
 200. SINCLAIR, J. H. Cretaceous of Alberta, Canada. Bull. Geol. Soc. Am., vol. 27, December, 1916, pp. 673-684; abstract, March, 1916, pp. 85-86. Describes formations, identification of fossils, etc., in the foothills of southern Alberta.
 201. SLIPPER, S. E. Boring operations in southern Alberta, Canada. Geol. Survey Summ. Rept. for 1915. 1916, pp. 116-120. Reviews year's work in boring for petroleum and the results obtained. Gives stratigraphy of the Cretaceous in the foothills area based on data obtained from the wells, and notes on the structural geology and the location of wells.
 202. WILLIAMS, M. Y. Guelph formation of Ontario. Bull. Geol. Soc. Am., vol. 27, Mar. 31, 1916, pp. 148-149, abstract. Describes this formation which is argillaceous and commonly bituminous.
- See also* Nos. 190, 313, 1342.

DEVELOPMENT AND PRODUCTION.

203. BOYLE, R. W., AND TORY, H. M. A physical test on a natural (methane) gas well. Trans. Roy. Soc. Canada, 3rd ser., vol. 9, sec. 3, 1915, 1916, pp. 139-145. Gives details concerning discovery of gas at Viking, Alberta, an analysis of the gas found, and tables and curves showing daily rates of flow, taken with a Pitot tube, and maximum pressures.
- See also* Nos. 189, 190.

PROPERTIES AND THEIR DETERMINATION.

204. ASHWORTH, JAMES. The composition of natural gas. Coal Age, vol. 10, July 22, 1916, pp. 146-147. Refutes the criticism of the Clapp report on oil and gas in Canada, as to gas analyses. (*See also* Canadian Min. Jour., vol. 37, Feb. 15, 1916, pp. 86-87; Apr. 1, pp. 157-158, 159.)
 205. ELLS, S. C. Investigation of bituminous sands of northern Alberta. Canada Department of Mines, Mines Branch, Summ. Rept. for 1915. 1916, pp. 67-76. Canadian Min. Jour., vol. 37, Feb. 1, 1916, pp. 73-74, abstract. Reviews work of mapping of the bituminous sand region, and gives results of investigation of the sands as a possible paving material. Conclusion is that Alberta bituminous sand can be successfully adopted as a basis for asphaltic surfaces.
 206. KEELE, J. Oil shales at Albert Mines and Baltimore. Canada Department of Mines, Mines Branch, Summ. Rept. for 1915. 1916, p. 137. Gives results of experiments to determine the usefulness of oil shales, after the oil is extracted, for the clay working industry. Concludes that if mixed with a plastic clay its qualities are improved, but not sufficiently to warrant its use.
- See also* Nos. 190, 203, 257.

STATISTICS.

FIELD DEVELOPMENT AND PRODUCTION.

207. Canada, Geol. Survey. Memoirs. Canada Department of Mines, Mines Branch. Annual report on the mineral production of Canada; Bulletins.
208. Great Britain, Mines and Quarries. General report, with statistics (annual), by chief inspector of mines; pt. 4, Colonial and foreign statistics.

209. HORE, R. E. Canadian mining manual. Toronto, 1916-17, p. 151. Describes oil fields and gives annual figures of production.
210. HEATON, E., ROBINSON, J. B., and DOBSON, W. J. Heaton's annual; the commercial handbook of Canada. Toronto, 1913, 530 pp. Contains material on mining and an economic bibliography of all government reports.
- PRICES.
211. Oil and Gas Journal. Weekly report. Prices of Canadian oil listed under "Eastern States."
212. Oil Trade Journal. Monthly report of price of Petrolia oil.
213. Petroleum. Monthly report of price of Canadian oil.
- STORAGE, *see* No. 190; Refining and refineries, *see* No. 189; Utilization, *see* Nos. 205, 206.

MEXICO.

OCCURRENCE.

214. CRUZ, S. C. Estudio del campamento de Tecuanapa (a study of the region of Tecuanapa). Bol. del Petróleo, vol. 2, November, 1916, pp. 423-446. Describes character, history, exploration, and exploitation of the field; gives cost of drilling, production statistics, and properties and value of the oil.
- 214a. DE GOLYER, E. The Furbero oil field, Mexico. Trans. Am. Inst. Min. Eng., vol. 52, 1916, pp. 268-280. Gives location, history and development, and geology of the field. *See also* Bull. Am. Inst. Min. Eng., Sept., 1915, pp. 1899-1911. (No. 191, 915 Bibliography.)
- 214b. DUMBLE, E. T. The occurrences of petroleum in eastern Mexico as contrasted with those in Texas and Louisiana. Trans. Am. Inst. Min. Eng., vol. 52, 1916, pp. 250-265; discussion, pp. 265-267. *See also* Bull. Am. Inst. Min. Eng., Aug., 1915, pp. 1623-1638; Discussion, December, 1915, pp. 2434-2435. (No. 192, 1915 Bibliography.)
215. ESPINOSA, E. M. Petróleo en Chiapas (Petroleum in Chiapas). Bol. del Petróleo, vol. 2, July, 1916, pp. 22-23. Gives localities in which "chapopote" is found in this region.
216. LAVIN, J. D. Introducción a la explotación del petróleo Mexicano (Introduction to the development of Mexican petroleum). Bol. del petróleo, vol. 2, October, 1916, pp. 307-367. Gives a detailed account of the Mexican industry. Discusses drilling, producing, and transportation methods.
217. VILLARELLO, J. D. Apuntes sobre la region petrolifera Tabasco-Chiapas (Notes on the petroleum region of Tabasco-Chiapas). Bol. del petróleo, vol. 2, July, 1916, pp. 10-17. Discusses the transportation facilities, topography, and geology of the region and the surface indications of oil.
- See also* Nos. 3, 4.

GEOLOGY AND ORIGIN.

218. ORDÓÑEZ, EZEQUIEL. Ligero apunte sobre los campos petroliferos de México (Information on the petroleum fields of Mexico). Bol. del petróleo, vol. 2, August, 1916, pp. 96-99. Article shows that the connection between petroleum and volcanic formations has nothing to do with the origin of petroleum, which the author believes to be purely organic.
219. WHITE, I. C. Geological features of the Cerro Azul well in Mexico. Pan American Rec., vol. 1, November, 1916, pp. 7-10. Address delivered at National Exposition of Chemical Industries, Sept. 26, 1916. Reviews the history of the well and the geologic conditions accompanying it.
- See also* No. 217.

DEVELOPMENT AND PRODUCTION.

- 220.** BAZ, JULIO. Accidentes en los grandes pozos de petróleo (Accidents at large petroleum wells). Bol. del petróleo, vol. 1, February, 1916, pp. 132-140. Describes methods of extinguishing oil fires in Mexico.
- 221.** FASBINDER, A. G. A fire that burned four months. Pop. Sci. Monthly, vol. 88, January, 1916, pp. 3-6. Describes the burning and extinguishing of the fire at Potrero del Llano No. 4, near Tampico, Mexico.
- 222.** MEXPET RECORD. Cerro Azul No. 4, world's greatest oil well. Vol. 1, March, 1916, pp. 10-16. Describes discovery of this well on Feb. 10, 1916. See also Nos. 214, 216, 217, 219.

TRANSPORTATION, STORAGE, AND DISTRIBUTION.

- 223.** BAZ, CARLOS. Bases que se proponen para la formación de tablas y reglamentos oficiales para la medición del petróleo (Basis considered for the formation of tables and official rules for measuring petroleum). Bol. del Petróleo, vol. 2, July, 1916, pp. 17-22. Gives rules and formulas for the official and uniform measurement of petroleum in Mexico.
- 224.** LANGARICA, ALBERTO. Desperdicio de los recursos naturales (Waste of natural resources). Bol. del Petróleo, vol. 2, November, 1916, pp. 415-422. Discusses causes of waste of petroleum and natural gas, particularly evaporation while in storage, and natural-gas gasoline manufacture as a means of conserving gas. Concludes that government regulation is the only efficient means of checking losses and suggests a prescribed percentage of evaporation tolerance and method of determining it.
- 225.** ——— A propósito del almacenamiento de petróleo (On the method of storing petroleum). Bol. del Petróleo, vol. 2, August, 1916, pp. 100-108. Discusses storage of oil in wooden, concrete, earthen, and steel tanks in Mexico. Also construction of the tanks and fire hazards.
- 226.** STEWART, P. C. A. Submarine pipe-lines for loading tank steamers at Tuxpam, Mexico. West. Eng., vol. 7, January, 1916, p. 9. Extract from paper before the Inst. Petroleum Technologists, London. Describes methods of loading oil where ocean-going ships can not come near shore.
- 227.** VÁZQUEZ, LEOPOLDO. De la medición y calculo del petróleo (Measurement and calculation of petroleum). Bol. del Petróleo, vol. 1, January, 1916, pp. 26-31. Discusses measurement of volumes in storage, sampling, testing for specific gravity, etc.

See also Nos. 214, 216, 217, 583, 586.

PROPERTIES AND THEIR DETERMINATION, see No. 214.

STATISTICS.

EXPORTS.

- 228.** Oil Trade Journal. Monthly statement of shipments of oil from Tampico and Tuxpam into the United States, by points of destination.

IMPORTS.

- 229.** United States Geological Survey. Mineral Resources, pt. 2, Nonmetals. Gives annual statistics of petroleum and petroleum products imported into Mexico from the United States.

PRODUCTION OF PETROLEUM, NATURAL GAS AND ASPHALT.

- 229a.** HUNTLEY, L. G. The Mexican oil fields. Trans. Am. Inst. Min. Eng., vol. 52, 1916, pp. 281-321. Gives production 1904 to 1914 and list of companies operating.
- 230.** United States Geological Survey. Mineral resources, pt. 2, Nonmetals. Gives figures of annual production.

WEST INDIES.

GEOGRAPHIC OCCURRENCE, *see* Nos. 3, 4,

STATISTICS.

231. UNITED STATES GEOLOGICAL SURVEY. Mineral resources, pt. 2, Nonmetals. Gives annual production of petroleum and asphalt in the West Indies.

BARBADOS.

STATISTICS, *see* Nos. 16, 231.

CUBA.

PROPERTIES AND THEIR DETERIORATION.

232. ORTEGA, PABLO. Review of the present state of mining in Cuba. *Boletín de Minas, Habana, Cuba*, I. 1916, 157 pp. Gives a statistical review containing some analyses of Cuban petroleum.
STATISTICS, *see* Nos. 16, 231, 232.

TRINIDAD.

GEOLOGY AND ORIGIN.

233. NATIONAL PETROLEUM NEWS. Development of Trinidad oil territory. Vol. 8, July, 1916, p. 92. Gives a short review of conditions in Trinidad and discusses opening of a fuel-oil market for the navies of the world. Gives distillation test of Trinidad oil, its geologic occurrence, developing companies, and the uses to which the oil is being put.
234. WILLOCK, G. S. O. Description of Trinidad's oil fields. *Fuel Oil Jour.*, vol. 7, Jan., 1916, p. 49. Brief description of properties of oil and its occurrence.

PROPERTIES AND THEIR DETERMINATION.

235. MILLER, J. S. Colloids and their occurrence in Trinidad Lake asphalt. *Jour. Edg. Club, Baltimore*, vol. 6, Dec., 1916, pp. 131-136. Reviews progress in the study of colloids, the discovery of finely divided clay in Trinidad asphalt. Describes manner of occurrence in the asphalt.
See also Nos. 16, 233, 234.
UTILIZATION, *see* No. 233; Statistics, *see* No. 231.

PORTO RICO.

STATISTICS.

236. UNITED STATES BUREAU OF FOREIGN AND DOMESTIC COMMERCE. Monthly summary of foreign commerce of the United States. Gives quantity and value of crude and refined mineral oil shipped to Porto Rico.

SOUTH AMERICA.

GEOGRAPHIC OCCURRENCE, *see* Nos. 3, 4.

GEOLOGY AND ORIGIN.

237. BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Nomenclature of the carboniferous, permo-carboniferous, and permian rocks of the southern hemisphere. Report of the 85th meeting, Manchester, 1915. 1916, pp. 263-282. Report of the Australian members of the committee giving tables of suggested correlation of these rocks, and presenting points for discussion. Tables include New South Wales, Victoria, Queensland, West Australia, South Australia, Tasmania, New Zealand, South Africa, South America, and India.

STATISTICS.

PRODUCTION.

238. UNITED STATES GEOLOGICAL SURVEY. Mineral resources, pt. 2, Nonmetals. Gives annual production figures for principal producing countries.

ARGENTINA.

OCCURRENCE.

239. HERMITTE, E. M. Area, distribution and present working of petroleum deposits in Argentina. Jour. Ind. and Eng. Chem., vol. 8, February, 1916, pp. 194-195. Abstract of paper presented before the Pan-American Scientific Congress, 1915. Gives location and character of deposits, production figures for 1914 and 1915, and quality of oil.
240. PETROLEUM AGE. Latin-American oil developments. Vol. 3, July, 1916, pp. 7-10; September, 1916, pp. 12-14. Reviews developments in Latin-American countries: Argentina, Colombia, Brazil, Peru, Ecuador, Bolivia, Costa Rica, Chile.
241. WINDHAUSEN, ANSELMO. Los yacimientos petroliferos de la zona Andina (The petroleum deposits of the Andina zone). Argentine Republic, Dirección General de Minas, Geología e Hidrología, Bol. 15, ser. B, 1916, 27 pp. Includes provinces of Mendoza and Neuquen.

PROPERTIES AND THEIR DETERMINATION.

242. CORTI, HÉRCULES. Determinación del porcentaje de agua en el petróleo de Comodoro Rivadavia (Determination of the percentage of water in the petroleum of Comodoro Rivadavia). Argentine Republic, Dirección General de Minas, Geología e Hidrología, Bol. 3, ser. D, 1916, pp. 5-11. Discusses determination of water in suspension in viscous petroleum, by adding a light gasoline to the petroleum and allowing the water to separate.
243. DANKERT, E. G. Algunos ensayos y consideraciones sobre el coke del petróleo de Comodoro Rivadavia (Some experiments and considerations in regard to the coke of the petroleum of Comodoro Rivadavia). Argentine

Republic. Dirección General de Minas, Geología e Hidrología, Bol. 3, ser. D, 1916, pp. 12-15.

See also No. 239.

STATISTICS, *see* Nos. 238, 239.

PERU.

OCCURRENCE.

244. BLARDONE, GEORGE. High-grade oil is produced in Peru. Oil and Gas Jour., vol. 14, Mar. 9, 1916, p. 30. Short review of developments in Lobitos and other fields of Peru. Oil obtained tests above 30° B. and output for 1914 was nearly 2,000,000 bbls.

245. DEUSTUA, R. A. La industria del petróleo en el Perú durante 1915 (The petroleum industry in Peru during 1915). Inf. y Mem. Soc. Ing. Peru, vol. 18, Apr.-June, 1916, pp. 117-149. Paper presented at Second Pan-American Scientific Congress, 1915. Gives history of the industry, location and description of the petroleum deposits, and statistics of production, exploitation, imports and exports.

246. SINGEWALD, J. T., Jr. Mining industry of Peru. Eng. and Min. Jour., vol. 101, May 13, 1916, pp. 845-850. Briefly discusses the oil industry and its prospects.

See also No. 240.

PROPERTIES, *see* No. 244.

STATISTICS.

FIELD DEVELOPMENT AND PRODUCTION.

247. Peru, Cuerpo de Ingenieros de Minas. Boletins. Contain statistics of oil production, drilling, etc.

See also No. 245.

OTHER COUNTRIES.

OCCURRENCE, STORAGE, AND TRANSPORTATION, ETC.

248. MARSTRANDER, ROLF. The mineral resources of Uruguay. Mining Mag., vol. 14, June, 1916, pp. 315-320. Occurrence and composition of shales are given. Little is yet known of the oil possibilities.

249. PETROLEUM REVIEW. The oil regions of Ecuador. Vol. 34, March 4, 1916, p. 193. Describes geography of the region and discusses its natural facilities for transportation of oil, the lack of capital for oil exploitation, the oil indications, and the commercial facilities.

250. UNITED STATES DEPARTMENT OF COMMERCE. Ecuador developing oil industry. Daily consular and trade reports, No. 165, July 15, 1916, pp. 186-188. Gives location of deposits, cost of drilling, analysis of oil, and statistics of imports for years 1911 to 1915.

See also No. 240.

VENEZUELA.

STATISTICS.

EXPORTS.

251. UNITED STATES GEOLOGICAL SURVEY. Mineral resources, pt. 2, Non-metals. Annual statistics of asphalt.

EUROPE.

OCCURRENCE.

252. PETROLEUM ZEITSCHRIFT. Zur Lage der europäischen Schieferölindustrie mit besonderer Berücksichtigung Luxemburgs. Jahrg. 11, Sept. 20, 1916, pp. 1308-1315. Gives account of shale-oil industry in the Duchy of Luxembourg, Scotland, France, Sweden, and Germany, the extent of the development of oil-shale resources, the occurrence and composition of the shales, and the characteristics of distillation products.

TRANSPORTATION, STORAGE, AND DISTRIBUTION.

253. WALMSLEY J. The Danube and the petroleum industry. Petroleum World, vol. 13, May, 1916, pp. 227-229. Describes how petroleum can be transported from Russia and Roumania to the heart of Germany.
- PROPERTIES, *see* Nos. 252, 257.

STATISTICS.

PRODUCTION.

254. UNITED STATES GEOLOGICAL SURVEY. Mineral resources, pt. 2, Non-metals. Annual statistics for principal producing countries.

AUSTRIA-HUNGARY.

HISTORICAL REFERENCES AND GEOGRAPHIC OCCURRENCE.

255. ARNDT, R. The natural gas industry of Hungary. Petroleum World, vol. 13, August, 1916, p. 367, abstract. Discusses discovery of natural gas at Kissarmas in 1909, borings and development, compression and transportation facilities, industrial and other uses.
256. PETROLEUM ZEITSCHRIFT. Zur Geschichte und Oertlichkeit der Siebenbürgischen Erdgasfelder (On the history and location of the Transylvania gas fields). Jahrg. 11, Feb. 2, 1916, pp. 444-452.
257. POIS, ANTON. Das Erdgas und seine Erschliessung und wirtschaftliche Bedeutung (Natural gas, its development and commercial importance). Petroleum Ztschr., Jahrg. 11, July 19, 1916, pp. 1045-1053; Aug. 2, 1916, pp. 1101-1108; Aug. 16, 1916, pp. 1165-1174; Sept. 6, 1916, pp. 1232-1237. Considers especially the Hungarian fields, reviews the occurrence of natural gas in the principal producing countries and discusses its origin and geologic occurrence. Gives table of analyses of gas from the United States, Canada, and European countries and discusses physical and chemical characteristics. Discusses, also, drilling methods and machinery.

See also Nos. 3, 129.

GEOLOGY AND ORIGIN.

258. NOWAK, JAN. Ueber die tektonischen Bedingungen des Erdölvorkommens in den polnischen Ostkarpathen (on the structural conditions of oil

occurrences in the Polish East Carpathian). *Petroleum Ztschr., Jahrg.* 11, June 21, 1916, pp. 925-927; discussion, *Jahrg.* 11, Sept. 6, 1916, p. 1231. Discusses the relation between geologic structure and the occurrence of oil, the structure of this field, and oil prospects.

See also Nos. 129, 257.

DEVELOPMENT AND PRODUCTION.

259. MILLAR, ARTHUR. The raising of oil on the Boryslaw-Tustanowice oil fields of Galicia. *Petroleum World*, vol. 3, December, 1916, pp. 568-570. Describes method of swabbing deep wells and the construction of the plunger, winch, etc., used.

See also No. 129.

PROPERTIES AND THEIR DETERMINATION, *see* Nos. 131, 257; Refining and refineries, *see* No. 129; Transportation and storage and utilization, *see* No. 255; Statistics, *see* No. 254.

GERMANY.

HISTORY, GEOGRAPHIC OCCURRENCE, AND PROPERTIES, *see* No. 257; Utilization, *see* Nos. 1261, 1263.

GREAT BRITAIN.

OCCURRENCE.

260. FORBES-LESLIE, WILLIAM. The Norfolk oil-shales. *Jour. Inst. Petroleum Tech.*, vol. 3, December, 1916, pp. 3-26; discussion, pp. 27-35. Gives history and geologic and geographic occurrence of oil shales of England. The Wormegay shales of Norfolk are described in detail.
261. MANFIELD, W. H. Oil shales, with especial reference to those of the Dorsetshire Kimmeridgian series. *Jour. Inst. Petroleum Tech.*, vol. 2, April, 1916, pp. 162-182; discussion, pp. 182-190; bibliography, pp. 178-182, by W. H. Dalton. Reviews the geologic and geographic distribution of oil shales in the world and the origin and development of the British oil shale industry. Kimmeridge shales are described in detail and methods are given for proving, mining, treating, and utilizing them.
262. SELWYN-BROWN, ARTHUR. Fuel oil from shale. *Eng. Mag.*, vol. 50, March, 1916, pp. 913-920. Describes classes of shales and their mining and distillation. Discusses geology and origin of oil shales. Gives analyses of English, Welsh, and Scotch coals and shales. Properties and composition of albertite, tasmanite, and torbanite are included.
263. STEWART, D. R. Shale oil industry. *Jour. Soc. Chem. Ind.*, vol. 35, July 31, 1916, pp. 774-776. Gives occurrence, geographic and geologic, of the shale measures of Scotland. Describes distillation, refining, and use of shale products—crude oil, ammoniacal liquor, permanent gas, and spent shale.

See also No. 252.

GEOLOGY AND ORIGIN.

264. CONACHER, H. R. J. Oil shales and torbanites. *Trans. Geol. Soc. Glasgow*, vol. 16, part 2, pp. 164-192; *Petroleum Rev.*, vol. 35, Dec. 23, 1916, p. 509. Gives results of a microscopic study of the shales and torbanites of the Lothians to ascertain the substances in them that yield on distillation olefins, paraffins, and naphthenes in large proportions, whereas coal under similar treatment yields only tar containing small proportions of these compounds. Describes experiments and concludes that oil shales

and torbanites are derived from the same substances as coal—vegetable matter—but that in the shales there has been a much more complete elimination of the woody matter, leaving the resins, cellulose and mud.

265. CUNNINGHAM CRAIG, E. H. Petroleum or natural gas in Scotland. *Petroleum World*, vol. 13, June, 1916, pp. 269-271. Discusses whether or not Scotland possesses oil or gas in commercially important quantities; considers the series of strata, geologic structures, and evidence of the presence of petroleum found in anticlinal areas.

See also Nos. 260-263, 313.

PROPERTIES AND THEIR DETERMINATION.

266. BRITISH ENGINEERING STANDARDS COMMITTEE. British standard nomenclature of tars, pitches, bitumens, and asphalts when used for road purposes, and British standard specifications for tar and pitch for road purposes. Report No. 76, London, April, 1916, 16 pp.; extract in *Good Roads*, vol. 12, new ser., July 1, 1916, p. 31.

See also Nos. 252, 257, 260-262.

STATISTICS.

IMPORTS.

267. Great Britain, Mines and Quarries. General report, with statistics (annual), by Chief Inspector of Mines. Pt. 3, Output. Gives statistics, by countries.
268. *Petroleum Review*. The petroleum trade of England during 1915. Vol. 34, Jan. 8, 1916, pp. 25-26. Statistics of imports into the United Kingdom, by countries and kinds of products.
269. ———. Weekly review classifies imports by countries.

PRODUCTION OF PETROLEUM.

270. Great Britain, Mines and Quarries. General report, with statistics (annual), by Chief Inspector of Mines. Pt. 4, Colonial and foreign statistics. Gives production statistics for all British colonies.

PRODUCTION OF SHALE IN SCOTLAND.

271. Great Britain, Mines and Quarries. General report, with statistics, for 1916 (annual), by Chief Inspector of Mines. Pt. 3, Output. Gives statistics of oil-shale industry in Scotland.

TRANSPORTATION, STORAGE AND DISTRIBUTION, *see* No. 533; Refining, refineries, and utilization, *see* Nos. 261, 262, 263.

ROUMANIA.

GEOGRAPHIC OCCURRENCE AND GEOLOGY.

272. HENNION, CHARLES, JR. The new Baicoi field of Roumania. *Petroleum World*, vol. 13, August, 1916, pp. 375-376. Gives output of the field and describes location, geologic formation and occurrence of oil.

See also No. 3.

DEVELOPMENT AND PRODUCTION.

273. *PETROLEUM REVIEW*. The new well of the Romano-Americana Company in Roumania. Vol. 35, Aug. 12, 1916, pp. 133-134. Describes precautionary measures taken for capping of well. Discusses use of the Tacit-Puscariu valve and the perfect installation of the capping. A production of 45,000 tons has been obtained from one well without any loss or danger.

PROPERTIES AND THEIR DETERMINATION, *see* No. 747.

STATISTICS.

PRICES.

274. *Petroleum Review*. Home and foreign market intelligence gives weekly report of prices.

PRODUCTION.

275. *Petroleum Review*. Gives monthly production figures.

RUSSIA.

OCCURRENCE.

276. HOLIDAY, F. A. The Uralsk Province and its oil fields. *Jour. Inst. Petroleum Tech.*, vol. 2, February, 1916, pp. 87-117; discussion, pp. 118-122. Describes development of the oil fields, the geology of the region and occurrence of the oil, the refineries, and transportation facilities. Gives a list of places at which oil indications are found and a bibliography on the region. (*See also* No. 1340.)

277. *PETROLEUM AGE*. Russia's newly verified oil field. Vol. 3, August, 1916, pp. 13-15. Gives a general description of the region and history of oil developments.

See also No. 3.

GEOLOGY AND ORIGIN.

278. HUNTLEY, L. G. The Baku oil fields; discussion of a paper by A. Adiassevich. *Econ. Geol.*, vol. 11, Apr.-May, 1916, pp. 279-283. Criticism of statements on the Russian oil fields as to the thickness of some of the producing series of oil sands in the Baku district.

279. *PETROLEUM REVIEW*. The new Apsheron areas; why they will not justify commercial exploitation. Vol. 35, Oct. 14, 1916, p. 306; Oct. 21, 1916, p. 337. Considers rôle of geology in determining profitable deposits. Concludes that most of the areas are not commercially productive.

See also No. 276.

PROPERTIES. *See* No. 257.

STATISTICS.

FIELD DEVELOPMENT AND PRODUCTION.

281. *Petroleum Review*. Monthly statement of production and drilling operations in different fields.

PRICES.

282. *Petroleum Review*. Gives weekly report of prices.

TURKEY.

GEOGRAPHIC OCCURRENCE AND GEOLOGY.

283. DEBATIN, OTTO. Die Erdölschätze Mesopotamiens (The petroleum wealth of Mesopotamia). *Petroleum Ztschr.*, Jahrg. 11, May 17, 1916, pp. 818-820; *Petroleum Rev.*, vol. 34, Feb. 12, 1916, pp. 129-130. Gives history and modes of occurrence from Biblical times, and distribution at present time. Discusses lack of transportation facilities and prospects for future development.

284. DOELTER, C. Die Mineralschätze der Türkei (The mineral wealth of Turkey). *Montan. Rundschau*, Jahrg. 8, pp. 217-220; *Chem. Zentr.*, 1916, II, p. 108. Discusses the occurrence of petroleum and asphalt.

- 285.** DOMINIAN, LEON. Fuel in Turkey. *Bull. Am. Inst. Min. Eng.*, June, 1916, pp. 1022-1030. Gives geographic and geologic occurrences of oil and asphalt in Syria, Mesopotamia, and European Turkey and the history of the early use of oil and bitumens in Turkey.
- 286.** FRECH, E. Die Erdölvorkommen an der türkisch-persischen Grenze (The occurrence of petroleum on the Turko-Persian border). *Petroleum Ztschr.*, Jahrg. 11, Feb. 16, 1916, pp. 473-480. Describes the occurrences of petroleum in this region, with statements as to their strategical importance for the Bagdad railroad and for export.
- 287.** ——— Mineral resources of Asia Minor. *Jour. Soc. Chem. Ind.*, vol. 35, Mar. 15, 1916, p. 313. Brief descriptions are given of all mineral deposits, including petroleum.

OTHER COUNTRIES.

GEOLOGY AND ORIGIN.

- 288.** CHOFFAT. Les recherches d'hydrocarbures au Portugal (Hydrocarbon resources in Portugal). *Revue Sci.*, t. 54, Jan. 1-8, 1916, p. 26. Discusses possibilities of petroleum deposits in Portugal.

GEOGRAPHIC OCCURRENCE, *see* No. 252; Properties, *see* Nos. 252, 289.

DEVELOPMENT AND PRODUCTION.

- 289.** PETROLEUM WORLD. Italy's petroleum resources. Vol. 13, June, 1916, p. 275. Discusses possibilities of the Rivanazzano field. Gives well log and character of the oil. States that as a result of drilling, abundant indications of petroleum and gas suitable for use in engines have been found.
- 289a.** *Revista del Servizio Minerario* gives annual statistics for Italy.

ASIA.

STATISTICS.

PRODUCTION OF PETROLEUM, NATURAL GAS AND ASPHALT.

290. United States Geological Survey. Mineral Resources for 1915, pt. 2, Non-metals. Gives annual statistics for principal producing countries.

CHINA.

OCCURRENCE.

291. WAT, H. W. L. The minerals of Sze-Chuan, China. Mining Mag., vol. 15, July, 1916, pp. 20-23. Includes a description and occurrence of the brine, petroleum, and natural gas wells in the Red Basin. Describes method of obtaining the brine.

DEVELOPMENT AND PRODUCTION.

292. RICHARDSON, H. K. The salt wells of Tzuliutsing, China. Sci. Am. Suppl., vol. 82, Nov. 18, 1916, pp. 324-325. Describes the gas wells which are drilled in the same manner as the salt wells. The wells are not capped, but a cement box is built around the top, close under the ground, and serves as a gas collecting chamber.

See also Nos. 291, 338.

INDIA.

OCCURRENCE.

293. NASSE, V. P. H. The oil fields of Burma. Petroleum Rev., vol. 35, Dec. 9, 1916, pp. 473-474. Gives a brief general description of the fields.

See also No. 3.

GEOLOGY AND ORIGIN, *see* No. 237.

STATISTICS.

IMPORTS.

294. India Geological Survey Records. Gives annual statistics.

PRODUCTION OF PETROLEUM.

295. Great Britain. Mines and Quarries. General report, with statistics for 1915 (annual), by chief inspector of mines; pt. 4, Colonial and foreign statistics.

JAPAN.

HISTORICAL REFERENCE.

296. OIL AND GAS JOURNAL. Oil discovery in Japan in the seventh century. Vol. 15, Aug. 24, 1916, p. 32. Quotes from the Japanese Petroleum Times, giving early history of petroleum in Japan.

GEOLOGY AND ORIGIN.

297. KOBAYASHI, GIICHIRO. On the accumulation of oil and gas in the Miyagawa oil field, in the Province of Echigo. Bull. Imperial Geol. Survey of Japan, vol. 25, No. 2, 1916, pp. 41-46. Shows that the accumulation of oil and gas may not be easily explained by the anticlinal theory. Gives a detailed description of the surface and underground geology of the field.

PERSIA.

HISTORY AND GEOGRAPHIC OCCURRENCE, see No. 3.

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AFRICA.

GEOLOGY AND ORIGIN.

298. Dr TOIT, A. L. Report on the oil-shales of Impendhle county, Natal. South Africa Geol. Survey, 1916, 11 pp; South African Min. Jour., October 28, 1916, pp. 193-194. Gives geological description and map of region and occurrence and character of shale.

298a. HUME, W. F. Report on the oil fields of Egypt, with a geological map of the region from surveys of John Ball.

See also Nos. 237, 313.

STATISTICS.

299. UNITED STATES GEOLOGICAL SURVEY. Mineral Resources for 1915, pt. 2, Nonmetals. Annual production figures for Egypt.

HISTORY AND GEOGRAPHIC OCCURRENCE, *see* Nos. 3, 262; Properties, *see* No. 298; Maps, *see* No. 298.

OCEANIA AND MALAYSIA.

GEOLOGY AND ORIGIN.

- 300.** ANDREWS, E. C. Notes on the structural relations of Australasia, New Guinea and New Zealand. *Jour. Geol.*, vol. 24, Nov.-Dec., 1916, pp. 751-776. The oil fields of New Guinea suggest the Burmese or Malaysian origin of the New Guinea lines of structure.

STATISTICS.

PRODUCTION OF PETROLEUM AND ASPHALT.

- 301.** United States Geological Survey. Mineral Resources for 1915, pt. 2, Nonmetals. Gives annual statistics of principal producing localities.

AUSTRALIA.

GEOGRAPHIC OCCURRENCE, *see* No. 262.

GEOLOGY AND ORIGIN.

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- 303.** CLARKE, E. DE C. The reported occurrence of oil near Wonnepup, South-West Division. Western Australia Geol. Survey, Ann. Rept. of Progress for the year 1915, 1916, pp. 25-26. Describes indications of oil from the geological evidence as slight and unfavorable. (*See also* No. 304.)
- 304.** SIMPSON, E. S. On samples of supposed petroleum-bearing earths and water from Wonnepup. Western Australia Geol. Survey, Ann. rept. of Progress for the year 1915, 1916, p. 26. Gives results of examination of samples of wet sand, clay, and water from this region and concludes that there are no indications of petroleum residues. (*See also* No. 303.)
- 305.** WADE, ARTHUR. Petroleum prospects of Bruny Island, Tasmania. Tasmania Parliament Report No. 60, 1916, — pp.; *Petroleum Rev.*, vol. 35, Aug. 19, 1916, pp. 153-154; Aug. 26, pp. 175-176. Considers in detail the geology of the northern part of the island, which consists chiefly of diabase rocks which have been intruded into, and which have considerably affected, a series of strata of Permo-Carboniferous age. Concludes that evidence on finding of seepages without complete investigation is insufficient, and that neither the presence of coal beds nor of fossils necessarily indicates the presence of oil.

See also Nos. 237, 313.

DEVELOPMENT AND PRODUCTION.

306. DUNLEAVY, F. L. Drilling for oil in Australia. Oil age, vol. 12, March, 1916, pp. 14-15. Describes attempt to discover oil. Machines capable of drilling to 4,000 feet are being used. Oil claims can not exceed 640 acres in area. Mining laws are liberal.

BORNEO, JAVA, AND SUMATRA.

HISTORY AND GEOGRAPHY OCCURRENCE, *see* No. 3.

NEW GUINEA.

GEOLOGY AND ORIGIN, *see* No. 300.

NEW ZEALAND.

GEOLOGY AND ORIGIN, *see* No. 237.

307. FRASER, MALCOLM. The New Zealand Official Year-Book, 1916. Prepared under the instruction of the Government of New Zealand. Wellington, 1916, p. 491. Briefly reviews petroleum situation in New Zealand and gives analyses of New Zealand oil.

PHILIPPINES.

GEOLOGY, ORIGIN, AND PROPERTIES.

308. PETROLEUM REVIEW. Oil fields of Tayabas Peninsula, Philippine Islands. Vol. 35, Nov. 4, 1916, pp. 375-376. Gives a geologic study of the region, characteristics of the oil, and a discussion of future prospects.
309. PRATT, W. E. The occurrence of petroleum in the Philippines. Econ. Geol., vol. 11, Apr.-May, 1916, pp. 246-265. Gives geology, stratigraphy, structure, and occurrence of petroleum, by districts. Table shows results of fractional distillation. Character and commercial possibilities of the petroleum are given.

STATISTICS.

310. UNITED STATES BUREAU OF FOREIGN AND DOMESTIC COMMERCE. Monthly summary of foreign commerce of the United States. Gives quantity and value of crude and refined mineral oils exported to the Philippine Islands.

NEW CALEDONIA.

OCCURRENCE.

211. PETROLEUM WORLD. Oil struck at New Caledonia. Vol. 13, Nov., 1916, p. 538. Gives a short account of finding of oil seepages on this island and predicts further success in drilling.

GEOLOGY AND ORIGIN.

GENERAL GEOLOGY.

312. CHAPP, F. G. The geology of petroleum. The American Petroleum Industry, by R. F. Bacon and W. A. Hamor. New York, 1916, pp. 34-68. Reviews the surface indications of petroleum, character and geologic age of oil bearing formations and their stratigraphic and structural relations, the migration of petroleum, and types of structure with which oil pools are associated. Gives a classified arrangement of petroleum accumulations based on geologic structure.
313. CUNNINGHAM-CRAIG, E. H. Kerogen and kerogen shales. Jour. Inst. Petroleum Tech., vol. 2, June, 1916, pp. 238-269; discussion, pp. 270-273. An inquiry into the origin of kerogen and the manner in which it has become associated with argillaceous beds to form kerogen shales. Discusses geologic, microscopic and chemical evidence of the occurrence of kerogen. Short accounts are given of the geological history of the known oil-shale fields of Scotland, South Africa, New South Wales, and Canada.
314. HAGER, DORSEY. Practical oil geology; the application of geology to field problems. New York, 1916, 2nd ed., 187 pp.
315. ROGERS, G. S. Oil field waters and their chemical relations to oil; particularly the conversion of sulphates into carbonates by hydrocarbons. Jour. Wash. Acad. Sci., vol. 6, Apr. 4, 1916, pp. 189-190, Abstract. Gives results of a study of several hundred analyses of water from the San Joaquin Valley oil fields, California. Heaviest oil is that nearest the outcrop and that in zone of "tar sands" above main oil zone.
- See also* Nos. 2, 3, 257.

GEOLOGIC STRUCTURE.

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317. CONKLING, R. A. The influence of the movement in shales on the area of oil production. Bull. Am. Inst. Min. Eng., Nov., 1916, pp. 1968-1972. As a possible aid in making estimates of production and values of oil properties, author describes the thickening of shale in a section of the Cushing pool.
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319. NATURAL GAS JOURNAL. What is an anticline? Vol. 10, March, 1916, pp. 100-101. Gives questions and answers relative to anticlines.
- See also* Nos. 142, 312.

ORIGIN—THEORIES.

320. CLARKE, F. W. The natural hydrocarbons. Bull. 616, U. S. Geol. Survey, 1916, pp. 713-726. Gives analysis of different oils and theories of origin.

Reviews experiments in laboratory preparation of hydrocarbons from inorganic sources and from more complex organic matter.

321. RICHARDSON, CLIFFORD. Gilsonite and grahamite: the result of the metamorphism of petroleum under a particular environment. *Jour. Ind. and Eng. Chem.*, vol. 8, June, 1916, pp. 493-494. Discusses briefly the effect of environment on formation of widely differing products of petroleum, asphalt being derived from horizontal layers of bitumen, while gilsonite and grahamite are the result of changes occurring in narrow almost vertical veins. The asphalts contain more than 20 per cent of saturated hydrocarbons and the gilsonites and grahamites contain only a small amount.
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323. TAYLOR, F. B. Theories as to origin of oil. *Oil and Gas Jour.*, vol. 14, May 25, 1916, pp. 30-31. Gives short reviews of organic and inorganic theories of White and Orton, and Moisson. Discusses also theory that pools are connected as if by forks of a stream, and oil sands were deposited as are the sands in beds of streams at present time.

See also Nos. 218, 262.

INORGANIC THEORY, *see* no. 323.

ORGANIC.

324. CHAUTARD, JEAN. The origin of petroleum. *Petroleum Rev.*, vol. 34, May 13, 1916, p. 398; May 27, p. 432. *Revue Sci.*, t. 54, Aug. 12-19, 1916, p. 501. Concludes that geology does not give any arguments favorable to a theory of inorganic origin of petroleum.
325. CUNNINGHAM-CRAIG, E. H. The origin of oil shales. *Proc. Roy. Soc. Edinburgh*, vol. 36, 1916, pp. 44-86. Discusses relation of oil-rocks and oil-shales and the composition of kerogen and oil-shale. Concludes that oil-shale fields and oil fields are closely connected.
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See also Nos. 218, 313, 323.

ACCUMULATION.

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- 327a. JOHNSON, R. H. The rôle and fate of the connate water in oil and gas sands. *Trans. Am. Inst. Min. Eng.*, vol. 51, 1916, pp. 587-592; discussion pp. 592-610. Conclusions are that with depth an increase of gas is found and a decreased quantity of oil finds its way into the larger pores. *See*

also Bull. Am. Inst. Min. Eng., Feb., 1915, pp. 221-223; discussion, May 1915, pp. 1157-1162, July, 1915, pp. 1449-1459, Sept., 1915, pp. 2957-2969. (No. 343, 1915 Bibliography.)

- 328.** McCoy, A. W. Some effects of capillarity on oil accumulation. Jour. Geol., vol. 24, Nov.-Dec., 1916, pp. 798-805. Points out the possibility that capillary forces have caused anticlines in nature.

See also Nos. 185, 197, 312.

OIL AND GAS RESERVOIR PRESSURES.

- 329.** Cooper, A. S. Closed pressure of gas wells. California Derrick, vol. 9, April, 1916, pp. 3-4. Gives short discussion of the relation between hydrostatic pressure and gas pressure, with diagrams.

APPLIED GEOLOGY.

- 330.** OIL AND GAS JOURNAL. Geological science applied to oil. Vol. 14, Jan. 13, 1916, p. 67. Discusses the value of scientific investigation over the old-fashioned methods of finding oil.
- 331.** STANDARD OIL BULLETIN. The geologist's part in oil production. Vol. 4, August, 1916, pp. 3-5, 12. Discusses selection of territory in California for development, the prospecting for deeper oil sands, and the relationship of water and oil sands in developed fields.

DETERMINATION OF OIL AND GAS FIELDS.

- 332.** JOHNSTON, JOHN, and ADAMS, L. H. On the measurement of temperature in bore-holes. Econ. Geol., vol. 11, December, 1916, pp. 741-762. Knowledge of the temperature gradient under the earth's crust may be of economic value and may aid in the discovery of coal or oil. Describes how such temperature may be accurately measured. The limits of accuracy of different kinds of thermometers are defined and methods of using them explained. Tabulated results are given for three wells.

PATENT.

- 333.** SQUIRES, FREDERICK. Method of locating natural gas. U. S. patent 1,168,757, Jan. 18, 1916.

DEVELOPMENT AND PRODUCTION (OIL AND GAS).

GENERAL TREATISES.

334. GALPIN, S. L. Petroleum engineering. Iowa Engineer, vol. 17, November, 1916, pp. 45-48. Reviews briefly the development of an oil property and emphasizes the growing need for specialists and engineers in this field.
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336. JOHNSON, R. H. Efficiency in the production of petroleum. The American Petroleum Industry, by R. F. Bacon and W. A. Hamor, New York, 1916, vol. 1, pp. 410-436. Discusses methods of leasing and paying royalties, keeping of logs, location of test wells, spacing of wells, and depths to which they should be drilled, pumping methods, stimulation of production, and control of wild wells.
337. JOHNSON, R. H., and HUNTLEY, L. G. Principles of oil and gas production. New York, 1916, 371 pp. A general treatise, with reference chiefly to conditions in America.

See also Nos. 3, 314.

DRILLING (METHODS, TOOLS, AND EQUIPMENT).

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See also Nos. 190, 216, 257.

DRILLING METHODS.

PERCUSSION.

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ROTARY.

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DRILLING TOOLS.

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- 342. CROSBY, E. H. L. Drilling tools and rods and fishing tools having screwed joints. English patent 6,718, issued on May 5, 1915; described in *Petroleum World*, vol. 13, July, 1916, pp. 313-314.
- 343. HAUSSENS, Alexandre. Apparatus for forming boreholes in soft strata. English patent 8902, Apr. 4, 1916; application, June 16, 1915.
- 344. HEDDER, C. M., HEDDER, C. C., and HEDDER, J. W. Method of marking well-tools. U. S. patent 1,169,642, Jan. 25, 1916.
- 345. HUMASON, G. A. Drill bit. U. S. patent 1,191,310, July 18, 1916. Canadian patent 173,272, Nov. 21, 1916.
- 346. KECK, W. M. Well-drilling apparatus. U. S. patent 1,179,010, Apr. 11, 1916.
- 347. LAWS, W. S. Oil-well drill. U. S. patent 1,171,741, Mar. 7, 1916.
- 348. LOUDEN, W. J. Casing spear. U. S. patent 1,170,294, Feb. 1, 1916.
- 349. MACKEY, F. O. Tool for slotting a well casing. U. S. patent 1,189,984, July 4, 1916.
- 349a. MARNEY, R. A. Well-drilling bit. U. S. patent 1,171,332, Mar. 7, 1916.
- 349a. PERKINS, C. F. and Perkins Macintosh Petroleum Tool and Boring Co. Couplings for hollow or solid shafts for well sinking, boring, etc. English patent 3250, Mar. 1, 1915.
- 350. RAND, Ed. Well-drilling apparatus. U. S. patent 1,168,226, Jan. 11, 1916.
- 351. RICHARD, L. L. Sand-pump for wells. U. S. patent 1,203,784, Nov. 7, 1916.
- 352. SHELTON, W. J. AND HALSTED, R. J. Fishing tool for wells. U. S. patent 1,208,846, Dec. 19, 1916.
- 353. SNELLING, W. O. Method of removing drilling tools. U. S. patent 1,196,819, Sept. 5, 1916.
- 353a. WAKFER, W. H. Drill. U. S. patent 1,169,369, Jan. 25, 1916.
- 354. WALKER, M. B. Well drill. U. S. patent 1,189,513, July 4, 1916.
- 355. WEATHERSBY, F. R. Drill. U. S. patent 1,206,488, Nov. 28, 1916.
- 356. WOODWARD, R. L. Well drill. U. S. patent 1,197,882, Sept. 12, 1916.
- 357. WRIGHT, C. S. Well-drilling apparatus. U. S. patent 1,182,337, May 9, 1916.
- 357a. BROWNWOOD, J. W. Bore-hole apparatus. English patent 4878, Mar. 29, 1915. "An undercutting drill for use at the bottom of well casings."

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- 359. CARROLL, M. W. Boring tool. U. S. patent 1,202,966, Oct. 31, 1916.
- 360. CASHMAN, C. G. Reamer head. U. S. patent 1,168,160, Jan. 11, 1916.
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- 362. CRAVEN, J. F. Underreamer. U. S. patent 1,177,172, Mar. 28, 1916.
- 363. ——— Well-drill jar. U. S. patent 1,189,241, July 4, 1916.
- 364. FERRIER, JAMES. Well-drilling device (percussion tool). Canadian patent 172,318, Oct. 10, 1916.
- 365. FITCHETT, FRANK. Underreamer. U. S. patent 1,197,471, Sept. 5, 1916.
- 366. GRANT, JOHN, AND CAMPBELL, L. S. Underreamer. U. S. patent 1,179,299, April 11, 1916.
- 367. HUMASON, G. A. Combined underreamer and bit. U. S. patent 1,171,790, Feb. 15, 1916.

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370. MAYNES, C. T., AND YANDA, F. C. Clamp for well-drilling cables. U. S. patent 1,169,849, Feb. 1, 1916.
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386. GIBEAU, J. M. Core barrel for drilling machines. U. S. patent 1,179,173, Apr. 11, 1916.
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395. ——— Reaming drill. U. S. patents 1,174,575, 1,176,964, Mar. 7, 28, 1916.
396. ——— Retaining means for rotary drill cutters. U. S. patent 1,174,577, Mar. 7, 1916.
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399. ——— Rotary boring drill. U. S. patent 1,209,299, Dec. 19, 1916.
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- 401a. MOLITOR, G., AND HARRIS, R. U. Rotary drills. English patent 22916, Nov. 23, 1914.

- 402. OAKLEY, JOHN. Deep-hole drill. U. S. patent 1,189,727, July 4, 1916.
- 403. SCHMUCK, P. A. Rotary well-drilling apparatus. U. S. patent 1,196,933, Aug. 29, 1916.
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- 407. ZIERATH, A. C. Rotary drilling machine. U. S. patent 1,173,138, Feb. 22, 1916.

EQUIPMENT.

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RIGS AND DERRICKS—PATENTS.

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- 410. CATER, W. H. Means for protecting drilling ropes against wear. U. S. patent 1,189,428, July 4, 1916.
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- 415. ELECTRICAL REVIEW AND WESTERN ELECTRICIAN. Savings effected by pumping oil wells by electricity. Vol. 68, May 13, 1916, p. 852. Gives cost figures for drilling and pumping wells by electricity on several California oil properties. Compares cost of the same work by steam power.
- 416. OIL AGE. The new water-softening process. Vol. 12, July, 1916, pp. 9-10, 12-13. Describes process for softening boiler water; is applicable to California oil fields, where water is hard and impure.
- 417. OIL AND GAS JOURNAL. Use of electricity in oil lease work. Vol. 14, Jan. 13, 1916, p. 61. Enumerates advantages of electricity, such as continuity of service, little need of repairs, etc.
- 418. TAYLOR, W. G. Motor equipments for the recovery of petroleum. *Proc. Am. Inst. Elec. Eng.*, vol. 35, June, 1916, pp. 759-772; discussion, October, 1916, pp. 1492-1493. *Trans. Am. Inst. Elec. Eng.*, vol. 35, pt. 1, 1916, pp. 539-552; discussion, pp. 553-554. Describes use of slip-ring induction motors in drilling, pumping, and cleaning oil wells. Gives data on horsepower required and kilowatt-hour consumption for various operations.

CASING AND FITTINGS.

See No. 502.

PATENTS.

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423. HARVEY, J. O. Well-casing machinery. U. S. Patent 1,197,287, Sept. 5, 1916.
424. HOVIS, P. S. Release joint for well casings. U. S. patent 1,199,029, Sept. 19, 1916.
425. MCKISSICK, W. H. Tubing-catcher for oil wells or the like. U. S. patent 1,201,483, Oct. 17, 1916.
426. MAXWELL, J. H. Detachable oil-well casing puller. U. S. patent 1,209,006, Dec. 19, 1916.
427. MOSER, F. J. Casing head for wells. U. S. patent 1,194,863, Aug. 15, 1916.
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- PROTECTION AGAINST CORROSION, *see* Nos. 509-511.

CONTROL OF WATER AND WASTE.

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435. TACITUS, V. A new method of checking water shut-offs. *Petroleum Rev.*, vol. 34, June 24, 1916, p. 509. Describes method of sinking into well a temporary column of 4-inch pipe, provided with a "stuffing box," which tightly closes well inside of casing. "Stuffing boxes" of Parker's system with leather bags are used.
- See also* Nos. 156, 157.

PACKERS—PATENTS.

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437. McNALLEN, A. J. Tubing and packing for oil wells. U. S. patent 1,173,825, Feb. 29, 1916.
438. MOSER, E. J. Well packer. U. S. patent 1,198,649, Sept. 19, 1916.
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MUD FLUID.

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the advantages of using mud-laden fluid in drilling to prevent wastes of oil and gas.

See also Nos. 83, 85.

CONTROL OF LARGE WELLS AND WELLS ON FIRE.

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447. MILLAR, ARTHUR. Oil well fires and how to prevent them. *Petroleum Rev.*, vol. 34, June 17, 1916, p. 492. Suggests use of specified table of distances between buildings and wells compiled by experienced operators; use of special non-return valves where gas is conveyed from the well for fuel; spark arresters on smithy cowls and boiler uptakes; good insulation, earthing, management of tools, ropes, etc., so as not to cause friction. Describes methods of extinguishing fires by heaping earth to form a crater around a flame issuing from a borehole; drawing off oil in pipes laid through an earthen wall, while keeping the pipe moist with water.

See also Nos. 119, 220, 221, 273, 336.

PLUGGING AND ABANDONING—PATENTS.

448. GILBERT, G. G. Well plug. U. S. patent 1,167,289, Jan. 4, 1916.
449. MILLER, D. C. Sealing plug for oil wells. U. S. patent 1,194,764, Aug. 15, 1916.
450. PIERCE, E. P. Plug for oil holes. U. S. patent 1,169,189, Jan. 25, 1916.
451. SAVAGE, G. M. Well shut off. U. S. patent 1,170,851, Feb. 8, 1916.
452. SITZMAN, C. E. Apparatus for plugging wells. U. S. patent 1,190,024, July 4, 1916.

PRODUCTION (METHODS, EQUIPMENT, AND OPERATIONS).

453. LIWEHR, A. E. Die Erdölförderung aus Bohrlöchern (oil production from drilling). *Petroleum Ztschr.*, Jahrg. 11, May 17, 1916, pp. 811-818; June 7, pp. 866-872; June 21, pp. 927-933. Reviews the various systems of oil production, such as bailing, pumping, use of compressed air, natural gas, etc., and discusses the advantages of each.

See also Nos. 216, 409.

WELL RECORDS, COST, ETC., *see* Nos. 61, 62, 155, 214, 248, 336, 415.

PUMPING OIL WELLS.

See Nos. 154, 336.

TOOLS AND EQUIPMENT—PATENTS.

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455. BRADLEY, W. H. Pump for oil wells. Canadian patent 171,156, Aug. 1, 1916.
456. BUTLER, C. A. Oil-well pump. U. S. patent 1,175,599, Mar. 14, 1916.
457. CHAPMAN, M. T. Pumping machinery. U. S. patent 1,174,122, Mar. 7, 1916.
458. ——— Pumping machinery. U. S. patent 1,174,121, Mar. 7, 1916.

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460. GARVER, OTTO, AND GRIDER, MARION. Oil well pump. U. S. patent 1,190,281, July 11, 1916.
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462. HAHN, JOHN. Oil-well equipment (pump tubing). U. S. patent 1,207,689, Dec. 5, 1916.
463. JONES, W. L. Deep-well pump. U. S. patent 1,181,457, May 2, 1916.
464. KNAPP, W. G. Oil or gas saver. U. S. patent 1,209,454, Dec. 19, 1916.
465. KNOKE, J. C. Well-tubing pump. U. S. patent 1,199,190, Sept. 26, 1916.
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- See also Nos. 375, 436-440, 442.*
- POWER. *see Nos. 75, 153, 415, 417, 418*; Other methods of oil production, swabbing, *see No. 259.*

CARE OF PRODUCING OIL WELLS.

CLEANING OUT.

See Nos. 418, 483.

PATENTS.

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472. MONROE, F. A. Device for cleaning oil wells. U. S. patent 1,198,566, Sept. 19, 1916. Described in *Min. and Eng. World*, vol. 45, Dec. 2, 1916, p. 952.

HEATING AND STEAMING—PATENT.

473. HUFF, W. D. Operating and reclaiming oil wells. U. S. patent 1,200,423, Oct. 3, 1916.

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See No. 239.

PATENT.

474. WILEY, C. A. Sand trap for oil wells. U. S. patent 1,204,105, Nov. 7, 1916.

GAS WELLS.

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- 476.** WYER, S. S. When is the drilling of off set wells for natural gas justifiable? Columbus, Ohio, 1916, 56 pp. Gives definitions of terms used and cost of operating wells. Discusses limits of reservoirs, acreage lease, rentals, and royalties, declining volume, questions of service, etc.
See also Nos. 481, 482.

PATENT.

- 477.** FORDING, W. G. Blow valve and operating means for gas wells. U. S. patent 1,182,083, May 9, 1916.
See also No. 441.

RECORDS AND COSTS, *see* Nos. 75, 151, 155.

PRODUCTION (GATHERING AND TREATMENT).

OIL—CLEANING AND TREATING FOR WATER, B. S., ETC.

- 478.** FRANCIS, C. K. Emulsified or cut petroleum. Jour. Ind. and Eng. Chem., vol. 8, August, 1916, pp. 682-684. Gives results of investigation to determine nature of emulsified oils produced in the Cushing, Oklahoma, field. Suggests methods for properly treating them to break the emulsion. Analysis of residue from cut oil from Bartlesville sand is given. Describes methods used in Oklahoma and California fields. A combination of electricity and hot water is used to separate emulsified petroleum.

GAS AND VAPOURS.

- 479.** PETROLEUM WORLD. Novel method of trapping gas from oil well. Vol. 13, September, 1916, pp. 416-417. Describes concrete dome built over well to cover all gas seepages from the well and force them to escape through pipes to a point some distance away where the gas is burned.
See also Nos. 475, 921, 957.

- 480.** WESTCOTT, H. P. Handbook of casing-head gas. Erie, Pa., 1916, 274 pp. Discusses production, properties, and uses of casing-head gas. Describes casing-head gasoline plant and methods of its operation, transportation of the finished product, etc.

COMPRESSORS AND CONDENSERS.

- 481.** WYER, S. S. Development of the law relating to the use of gas compressors in natural gas production. Bull. Am. Inst. Min. Eng., February, 1916, pp. 263-279; discussion, May, 1916, pp. 946-952. A chronological arrangement of decisions, 1885 to 1912, relating to the use of gas compressors.
- 482.** ——— Necessary use and effect of gas compressors on natural gas field operating conditions. Bull. Am. Inst. Min. Eng., Feb., 1916, pp. 281-297. Investigation in Ohio, with special reference to working pressure relations of gas wells discharging by natural rock-pressure flow without the use of compressors, and adjacent wells discharging to intake lines to gas-compressing stations.

RECORDS AND COSTS, *see* No. 415.

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- 483.** HUNTLEY, L. G. Possible causes of the decline of oil wells and suggested methods of prolonging yield. The American Petroleum Industry,

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See also No. 476.

ARTIFICIAL FACTORS, STIMULATION OF PRODUCTION.

See No. 336.

INCREASE OF PRESSURE BY AIR OR GAS.

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485. PETROLEUM WORLD. Making air drive oil to the well. Vol. 13, Jan., 1916, p. 32. Describes briefly "air process" for stimulation of production in declining wells.

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488. SQUIRES, FREDERICK. Method of recovering oil and gas. U. S. patent 1,198,078, Sept. 12, 1916.

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490. ——— "Flooding" process in old oil leases. Vol. 14, Apr. 20, 1916, p. 29. Criticism of the above article on flooding old oil territory. Emphasizes the importance of scientific investigation of sand and conditions before determining on a method of forcing out the oil.

WASTES AND CONSERVATION.

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491. NATURAL GAS ASSOCIATION OF AMERICA. Report of the committee on conservation. Proc. 11th Annual Meeting, vol. 8, 1916, pp. 353-368; discussion, pp. 368-374. Discusses conservation of natural gas and gives an account of the progress made in Oklahoma due to the conservation law of 1915 in that State. *See* Oklahoma Session laws 1915, 398.
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of its use. Waste of gas in drilling operations and in consumption is also discussed.

493. RITCHIE, N. E. A plea for conservation of natural gas. *Fuel Oil Jour.*, vol. 7, March, 1916, p. 100. Tells briefly of need of conservation laws in Texas. Makes suggestions as to requirements of law.

See also Nos. 95, 434.

MINING SOLID BITUMENS, *see* Nos. 129, 189, 261, 262.

FINANCIAL APPRAISEMENTS, ROYALTIES, CONTRACTS, COSTS, PRICES.

494. CAPPEAU, J. P. Some commercial factors involved in the appraisement of petroleum properties. *The American Petroleum Industry*, by R. F. Bacon and W. A. Hamor, New York, 1916, vol. 1, pp. 368-373. Discusses character of the petroleum, producing formations, age of the wells, and the physical condition of the property.
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See also Nos. 336, 476.

TRANSPORTATION, STORAGE AND DISTRIBUTION.

TRANSPORTATION.

PIPE LINES.

CONSTRUCTION AND MAINTENANCE.

501. COLLINS, A. L. Influence of viscosity in pumping crude oil. *Eng. News*, vol. 76, July 6, 1916, pp. 22-24. Discusses importance of viscosity factor in the design and operation of pipe lines rather than the gravity of the oil. Gives cost data for pipe-line construction. Ten years is considered the life of pipe line.
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503. HALL, A. S. The high pressure system; the welding of high pressure mains. *Nat. Gas Jour.*, vol. 10, March, 1916, pp. 113-117. Describes gas-compression system at Springfield, Mass. Methods of welding are applicable to mains for natural as well as artificial gas. Costs are given of compressor station and laying of mains.
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- See also* Nos. 71, 72, 214, 216, 217, 475, 480.

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STATION EQUIPMENT.

See Nos. 75, 501.

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LINE EQUIPMENT AND TOOLS—PATENTS.

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516. CRUGER, E. B. Apparatus for discharging dangerous liquids and gases. U. S. patent 1,182,460, May 9, 1916.
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518. FLANDERS, W. W. Attachment for gas meters. U. S. patent 1,180,482, Apr. 25, 1916.
519. FLORENCE, JOHN, AND FRAUER, C. Pipe testing plug. U. S. patent 1,178,145, Apr. 4, 1916.
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RECORDS AND STATISTICS. *see* No. 86; Financial costs. *see* Nos. 71, 72, 75.

TANK CARS AND TANK WAGONS.

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- 527a. ———. Specifications for tank cars. *Proc. 49th Ann. Convention*, June, 1915, pt. 2, pp. 932-946. Gives specifications for ordinary tank car and special car for volatile inflammable products with vapor tension of more than 10 pounds per square inch at 100° F.

See also No. 921.

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 529. LEVY, E. D., AND JACOBS, H. W. Tank car. U. S. patent 1,173,443, Feb. 29, 1916.
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 531. OSTRANDER, A. E. Tank car. U. S. patent 1,199,816, Oct. 3, 1916.
 532. PAUL, J. T. H. Tank car. U. S. patent 1,170,560, Feb. 8, 1916.

WATER TRANSPORTATION.

TANK STEAMERS.

533. STANDARD OIL BULLETIN. The origin of the tank steamship. Vol. 3, February, 1916, pp. 3-6. Describes briefly the first tanker built in 1886.

CONSTRUCTION AND MAINTENANCE.

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 539. PETROLEUM ZEITSCHRIFT. Neuerungen auf dem Gebiete der Lagerung feuergefährlicher Flüssigkeiten (New developments in the field of the storage of liquids). Jahrg. 11, March, 1916, pp. 578-580.
See also Nos. 161, 162, 190, 225, 766.

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 540. BRUN, H. C. E. Storage plant for inflammable fluids. U. S. Patent 1,184,620, May 23, 1916.

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542. MILLER, J. P. Oil-storage system and method of protecting stored oils. U. S. patent 1,186,417, June 6, 1916.

TANKS.

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547. POOR, G. H. Apparatus for storing and dispensing combustible liquids. U. S. patent 1,207,075, Dec. 5, 1916.
548. WILSON, J. H., and BENNETT, S. A. Top for oil tanks. U. S. patent 1,178,895, Apr. 11, 1916.

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- See also* Nos. 87, 88, 225.

PATENTS.

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551. WARNER, L. K. Tank. U. S. patent 1,191,629, July 18, 1916.

CONCRETE.

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- See also* Nos. 88, 225; Wooden, *see* No. 225.

PATENT.

553. MUNN, M. J. Oil-storage tank. U. S. patent 1,200,391, Oct. 3, 1916.
- See also* No. 549.

RESERVOIRS.

EARTHEN AND CONCRETE-LINED, *see* Nos. 161, 225.

See also No. 552.

TANK AND RESERVOIR EQUIPMENT—PATENTS.

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555. BROOKS, R. A. Surface-discharge apparatus for tanks. U. S. patent 1,203,578, Nov. 7, 1916.
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557. CRABTREE, E. F. Outlet fitting for tanks. U. S. patent 1,171,706, Feb. 15, 1916.
- 557a. CROMPTON, T. A. Apparatus for ventilating, steaming, or fire-extinguishing in tanks containing inflammable liquids. English patent 14331, Oct. 11, 1915.
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- 559a. GRIFFIN, F. A. Safety hand-hole cover for steam boilers and air and oil reservoirs. U. S. patent 1,192,417, July 25, 1916.
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- 560a. HOPKINS, A. G. Plastic can positions which may be used for mending tanks containing hydrocarbons, etc. English patent 19,437, Sept. 4, 1914.
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TEMPORARY AND SMALL CONTAINERS.

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563. MILLER, C. E. Steel barrel equipment. *Oildom*, vol. 6, Sept. 1, 1916, p. 428. Gives briefly the advantages of steel over wooden barrels and mentions method of manufacture used by the Pressed Steel Tank Co. of Milwaukee.
564. NESTER, F. The passing of the wood barrel. *Texaco Star*, vol. 3, January, 1916, pp. 10-12. Discusses the advantages of steel barrels, the importance of thorough cleaning for second use, the sampling of oil, and inspection before shipment.
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- 569. KESSLER, LOUIS. Gasoline storage tank. U. S. patent 1,189,997, July 4, 1916.
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MEASUREMENT OF VOLUMES AND WEIGHTS, GAGING AND METERING.

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629. REED, R. H. Safety apparatus for oil wells (tanks). U. S. patent 1,191,229, July 18, 1916.

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PROPERTIES AND THEIR DETERMINATION.

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PHYSICAL PROPERTIES.

DENSITY (SPECIFIC GRAVITY) AND COEFFICIENT OF EXPANSION.

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635. FORREST, C. N. Limitations of results of tests of bituminous materials. Canadian Engineer, vol. 30, Feb. 24, 1916, pp. 277-280. Discusses tests for specific gravity, flash point, etc., methods and apparatus used, and the limitations of results of these tests.
636. UNITED STATES BUREAU OF STANDARDS. Standard density and volumetric tables. Circular 19, Mar. 30, 1916, 5th ed., 67 pp. Contains density tables for oils, also conversion tables for degrees Baumé and specific gravity for liquids lighter than water and for liquids heavier than water.
637. ——— United States standard Baumé hydrometer scales. Circular 59, Apr. 5, 1916, 13 pp. Gives formulas showing the relation between Baumé degrees and specific gravity, and tables of corresponding values for liquids heavier than water and liquids lighter than water. Discusses use of American standard by manufacturers of hydrometers.
- See also* Nos. 8, 9, 664, 740, 750, 752, 754, 756, 767.

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- See also* No. 767.

BOILING POINTS AND VAPOR PRESSURES, EVAPORATION, VOLATILITY, FRACTIONAL DISTILLATION.

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MELTING POINTS, CRYSTALLIZATION, COLD TESTS, CONGEALING POINT.

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LUBRICATING VALUE.

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653. HERSCHEL, W. H. Lubricating value of oils. *Oildom*, vol. 6, May, 1916, pp. 241-243. Presents evidence against the property known as "body," and concludes that oils of the same viscosity should be equally valuable in a given bearing.
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655. HILPP, E. H. The lubrication of steam and internal-combustion engine cylinders. *Oildom*, vol. 6, April, 1916, pp. 193-194. Gives a short discussion of suitable oils and their compounding.
656. KAUFFMAN, J. L. Lubricating oils. *Jour. Am. Soc. Naval. Eng.*, vol. 28, August, 1916, pp. 692-707. Deals with lubricating oils used in marine service. Describes chemical, physical, and practical tests on all oils purchased for the use of the Navy.
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660. NATIONAL PETROLEUM NEWS. Fire test no check on lubricating value. Vol. 7, January, 1916, pp. 70-71. Explains why the ability of an oil to meet mechanical conditions has little to do with fire tests, which originated when kerosene was the only product of petroleum.
661. ——— Poor oil plays havoc with ice machines. Vol. 8, June, 1916, pp. 50-53. Discusses importance of using an oil of extremely low cold test and at the same time of moderately high flash and fire test, in order that oil will not congeal and will withstand the temperature developed in the condenser cylinder.

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668. SMITH, H. R. Comparative quality of oils. Power, vol. 44, Sept. 19, 1916, p. 426. Reply to letter of G. A. Smith (see No. 667), showing the impracticability of combining the chemical and physical characteristics of a lubricating oil to form an empirical mathematical rule for the determination of quality.
669. THOMP, L. E. Viscosity, its relation to quality in lubricating oils. Oil-dom, vol. 6, April, 1916, pp. 190-193, 296. Address before Western Oil Jobbers' convention, St. Louis. Emphasizes the importance of using a standard temperature representing using conditions in comparing oils in regard to viscosity. Describes practice in determining viscosity, and discusses its importance over all other tests for cylinder oils, lubricants, oils for filtering systems, etc.
670. UPTON, G. B. The properties of oils and their relation to lubrication. Sibley Jour. Eng., vol. 30, June, 1916, pp. 277-282. Discusses the meanings and purposes of various tests for lubricating oils, such as tests for acidity, ash, carbon residue, oxidation, volatility, surface tension, color, emulsion, flash and burning points, heat test, etc.
- See also Nos. 115, 641, 644, 739, 931, 1017.

OTHER PROPERTIES OF LIQUIDS.

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673. HAYES, H. C. AND LEWIS, G. W. The measurement of viscosity and a new form of viscosimeter. *Trans. Am. Soc. Mech. Eng.*, vol. 38, 1916, pp. 383-396; discussion, pp. 396-405. The coefficient of viscosity is defined and a working formula developed for its determination. Various types of meters are described.
674. HERSCHEL, W. H. Brief description of the test for demulsibility or resistance of an oil to emulsification with water, as developed by the Bureau of Standards. *Oildom*, vol. 6, May, 1916, pp. 243-244. Describes test applicable to non-emulsifying oils, for high-speed engines and turbines. Twenty c. c. of oil and 40 c. c. of water are placed in a 100 c. c. cylinder having an inside diameter of 1 inch and heated to 55° C. The oil and water are mixed by stirring with a paddle for five minutes at a speed of 1500 r. p. m. The paddle is a metal plate $3\frac{1}{2}$ in. by $\frac{7}{8}$ in. by $\frac{1}{2}$ in. thick.
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678. McILHINEY, P. C. The unit of viscosity measurement. *Jour. Ind. and Eng. Chem.*, vol. 8, May, 1916, pp. 433-435. To overcome the lack of uniformity in measurement of viscosity, the use of the term "poise" is suggested to express the unit of viscosity in C. G. S. units, with decimal multiple and sub-multiples expressed as "centipoise," etc. Gives table of the relation between readings of the Engler, Saybolt and Redwood viscosimeters.
679. OILDOM. The ignition of gasoline by electricity. Vol. 6, Aug., 1916, pp. 380, 382. Discusses ignition by sparks of static electricity. Concrete examples are given to show the real danger and three ways of generating

- electricity in handling gasoline are explained. Article is reprinted from "Travelers' standard."
680. POWER. Flow of oil through orifices. Vol. 44, July 11, 1916, pp. 58-59. Gives measurements of flow of fuel oil, power distillate, and Kansas crude under different pressures and through different sized orifices. The results are from experiments made at Iowa State University to obtain data applicable to oil-injection devices.
681. RICHARDS, T. W., AND SHIPLEY, J. W. The compressibility of certain typical hydrocarbons, alcohols, and ketones. Jour. Am. Chem. Soc., vol. 38, May, 1916, pp. 989-999. Describes an accurate, but simple, pressure gage. Gives data for the compressibility of 15 organic liquids, including benzene and toluene.
682. SAVILL, C. A., AND COX, A. W. On the viscosity of oils in the Redwood and Ostwald viscometers. Jour. Soc. Chem. Ind., vol. 35, Feb. 15, 1916, pp. 151-153. Gives method for converting viscosity determined in an Ostwald viscometer into viscosity determined in a Redwood viscometer, or vice versa, and also an improved method of calibrating the Ostwald viscometer.
683. STRATTON, S. W. Testing the demulsibility of engine oils. Power, vol. 43, Apr. 4, 1916, p. 485. Discussion of an article by F. T. Leilich (*see* No. 677). Correction of statements and explanation of demulsibility tests as developed and used by the United States Bureau of Standards.
- See also* Nos. 115, 478, 501, 639, 650, 652-654, 659, 669, 670, 684, 685, 767, 1308, 1309, 1313.

OTHER PROPERTIES OF SOLIDS.

684. AMERICAN SOCIETY FOR TESTING MATERIALS. A. S. T. M. standards. Philadelphia, 1916, 737 pp. Includes standard tests for soluble bitumen, penetration of bituminous materials, loss on heating of oil and asphaltic compounds, and a standard method for distillation of bituminous materials suitable for road treatment.
685. ——— Report of Committee D-4, on road materials. Proc., vol. 16, part 1, 1916, pp. 300-305. Contains proposed revised standard tests for penetration of bituminous materials, for loss on heating of oil and asphaltic compounds, methods for distillation of bituminous materials suitable for road treatment, for determining the softening point of bituminous materials other than tar products; and tentative definitions of terms applicable to materials relating to roads. For tests *see* No. 684.
686. ——— Report of Sub-committee, of committee D-4, on penetration of bituminous materials. Proc., vol. 16, pt. 1, 1916, pp. 306-315. (*See also* No. 685.)
687. ——— Tentative method for determination of softening point of bituminous materials other than tar products. Proc., vol. 16, pt. 1, 1916, pp. 549-550. Describes ring-and-ball method.
688. AMERICAN SOCIETY OF CIVIL ENGINEERS. Progress report of the special committee on materials for road construction and on standards for their test and use. Proceedings, vol. 42, December, 1916, pp. 1611-1642. Specifications are given for the various materials.
689. CROSSLEY, T. L. Note on ductility test of asphalt. Jour. Ind. and Eng. Chem., vol. 8, Jan., 1916, p. 89. In tests on briquets, differences in asphalts are shown by using two speeds, 5 centimeters per minute and 10 centimeters per minute, and pulling to 110 centimeters.

690. HUBBARD, PRÉVOST. What the highway engineer should know about bituminous materials. *Cornell Civil Engineer*, vol. 24, March, 1916, pp. 260-278. Gives classification of bituminous materials used in highway engineering and their general properties. Reviews refining processes and discusses tests and specifications for these materials.
691. HUBBARD, PRÉVOST, AND PRITCHARD, F. P. Effect of controllable variables upon the penetration test for asphalts and asphalt cements. *Jour. Agr. Research*, vol. 5, Jan. 24, 1916, pp. 805-818; reprint by U. S. Dept. of Agr., 1916, 16 pp. Describes tests made to determine what effect apparently slight differences in temperature, load and time produce and to study the importance of other variables.
- See also* Nos. 632, 633, 635, 646, 745, 771, 772, 774.

CHEMICAL PROPERTIES.

THERMOCHEMICAL.

FLASH AND BURNING POINTS, IGNITION POINTS, AND IGNITION MIXTURES.

692. BURRELL, G. A., AND BOYD, H. T. Quantity of gasoline necessary to produce explosive vapors in sewers. *Tech. Paper 117*, Bureau of Mines, 1916, 18 pp. Gives results of tests conducted in Pittsburgh, Pa.
693. EWELL, A. W. Gasoline, chamois and sparks. *Jour. Worcester Polytech. Inst.*, vol. 19, May, 1916, pp. 315-317. Describes experiments to prove that the passage of gasoline through chamois does not give rise to potential differences sufficient to produce sparks and cause explosions.
- 693a. HOLDE, D. Weiteres über die Entladung durch Ströme in engen Röhren elektrisch erregten Benzins in geerdeten Auffanggefässen (Further observations on discharges caused by electrically charged benzine flowing through narrow pipes into an earthed catch-vessel). *Ztschr. Elektrochem.*, Jahrg. 22, 1916, pp. 195-199; *Chem. Zentr.*, 1916, 1, p. 1285; *Chem. Abs.*, vol. 11, Apr. 10, 1917, pp. 885-886. Discusses danger of fires from this cause; suggests earthing of vessels, and adding a little acetic acid to liquid to increase conductivity.
694. MARTINI AND HÜNEKE. Conditions for the formation of explosive mixtures of benzene with air. *Chem. Ztg.*, Jahrg. 40, 1916, pp. 948-949; *Jour. Soc. Chem. Ind.*, vol. 35, Dec. 15, 1916, p. 1212. Shows that mixtures of benzene vapor with air explode within wider limits than mixtures of petroleum spirit with air. Petroleum-spirit mixtures containing from 2.4 to 4.9 per cent. were explosive. Mixtures of benzene vapor with air, explosibility limits were from 2.7 to 6.5 per cent.
- See also* Nos. 115, 635, 659-661, 670, 742, 767.

CALORIFIC POWER AND CALORIMETRY.

695. GRADY, W. H. Selecting and buying fuel. *Proc. Am. Wood. Preservers' Asso.*, 1916, pp. 91-99; discussion, pp. 99-103. Describes method of finding the most economical fuels on the basis of the cost per 25,000,000 B. t. u. Gives "purchasing engineer's fuel chart" showing use in comparing the heat values of coal, oil and gas fuels.
696. PATERSON, J. H. Fuel values. *Jour. Soc. Chem. Ind.*, vol. 35, Jan. 15, 1916, pp. 10-12. Compares fuels including oil fuel as to amount of heat that can be obtained from them by the expenditure of a definite amount

of money. The number of thermal units per penny is designated as the absolute heat value.

697. POWER. Heat value of fuels. Vol. 43, June 6, 1916, p. 790. Gives a table showing, for various fuels, solid, liquid and gaseous, the heat units per pound, relative values, and pounds of water evaporated per pound.
698. TAMARU, SETSURO. On the experimental technics of calorimetric measurements at high temperatures. Jour. Soc. Chem. Ind., vol. 35, Jan. 31, 1916, pp. 81-88. Gives description of apparatus used and methods and formulæ for measurement.
699. UNITED STATES BUREAU OF STANDARDS. Standard methods of gas testing. Circular 48, 1916, 2nd. ed. 202 pp. Presents standard methods for testing of heating values, measurement of volumes, candlepower determination, etc. Describes laboratories and equipment necessary for official testing. See also Nos. 638, 659, 741, 743, 757.

ILLUMINATING POWER, BURNING QUALITIES AND PHOTOMETRY, see Nos. 699, 739.

THERMAL DECOMPOSITION OR "CRACKING."

700. DAVIES, E. L. Experiments on the production of gasoline from hydrocarbon oils of high boiling points. Jour. Ind. and Eng. Chem., vol. 8, Feb., 1916, pp. 114-118. Describes apparatus experiments for determining the best conditions for cracking the oil and for saturating with hydrogen those portions converted into unsaturated compounds.
701. EGLOFF, GUSTAV. The thermal and pressure decomposition of pentanes and hexanes. Met. and Chem. Eng., vol. 15, Dec. 15, 1916, pp. 692-696. In order to ascertain the mechanism of aromatic hydrocarbon formation from paraffins and to study the elimination from petroleum oils of fractions not conducive to their formation, a mixture of pentanes and hexanes was studied with reference to the liquid products, benzene, toluene, xylene, naphthalene and anthracene, resulting from their decomposition.
702. ——— The thermal decomposition of the aliphatic hydrocarbon derivatives of naphthalene. Met. and Chem. Eng., vol. 15, Aug. 1, 1916, pp. 125-127. Gives results of an investigation of effect of pressure and temperature on formation of benzene and toluene from a tar oil composed mostly of aliphatic derivatives of naphthalene.
703. EGLOFF, GUSTAV, AND MOORE, R. J. Catalysis in the formation of gasoline from kerosene. Met. and Chem. Eng., vol. 15, July 15, 1916, pp. 67-79. Gives results of investigation of the catalytic effect of chloride of metals and non-metals upon the formation of gasoline from a paraffin-base kerosene and discusses the probable mechanism of the reaction.
704. ——— The effect of aluminum chloride upon a naphthene base oil in the formation of gasoline, unsaturated and aromatic hydrocarbons. Met. and Chem. Eng., vol. 15, Sept. 15, 1916, pp. 340-350. Gives a detailed description of experiments and full data of results.
705. EGLOFF, GUSTAV AND TWOMEY, T. J. The effect of temperature on the formation of benzene, toluene, xylene, naphthalene, and anthracene from petroleum at atmospheric pressure. Jour. Phys. Chem., vol. 20, February, 1916, pp. 121-150. Reviews work done on the cracking of petroleum for the aromatic hydrocarbons. Describes the apparatus and procedure in experiments with a gas-oil distillate from Pennsylvania crude. Describes changes with increased temperature and percentage of hydrocarbons former.
706. ——— The effect of temperature on the formation of olefins from petroleum at atmospheric pressure. Met. and Chem. Eng., vol. 14, Mar. 1,

1916, pp. 247-250. In order to show the influence of temperature on the unsaturated hydrocarbon formation in certain distillation cuts, a gas oil from Pennsylvania crude was cracked in the gas state by passing it through a steel tube at atmospheric pressure at temperatures from 450° to 800°. The method of procedure is explained and the results are given.

707. ——— The formation of aromatic compounds from the cracking of a gas oil. *Met. and Chem. Eng.*, vol. 15, July 1, 1916, pp. 15-18. Describes experiments made to determine the yields of the aromatic hydrocarbons, benzene and toluene, from the cracking of a gas oil at atmospheric pressure, various temperatures, and at a constant rate of flow. The conclusion is that benzene, toluene, and xylene, relatively free from paraffin hydrocarbons, can be produced.

708. ——— The production of aromatic hydrocarbons from paraffin wax. *Jour. Phys. Chem.*, vol. 20, June, 1916, pp. 515-521. The cracking of paraffin wax by passing through a heated tube, or the gas-phase method, was used to show the possibility of forming benzene, toluene, and xylenes from paraffin wax under conditions like those resulting in the formation of the same compounds from petroleum cracking.

709. ——— The re cracking of cracked oils produced from petroleum. *Jour. Phys. Chem.*, vol. 20, October, 1916, pp. 597-620. An investigation to determine advisability of using distillate from cracked petroleum for further cracking and to ascertain yields of either gasoline or aromatics which might be obtained. It was found that cracked oil is adapted for production of aromatics, though giving smaller yields than petroleum, and not being as well adapted for production of gasoline; and that carbon formation is greater when cracked oil is re cracked than when petroleum is cracked.

710. ——— Time factor in the formation of aromatic hydrocarbons from a paraffin-base oil. *Met. and Chem. Eng.*, vol. 15, Sept. 1, 1916, pp. 245-250. In the formation of benzene, toluene, and xylene by cracking a gas oil from Pennsylvania crude at a constant temperature of 700° C., pressure of 150 lbs., and rates of flow of 12 to 36 gals. per hour, a study was made of the effect of rate of flow on the per cent of recovered oil and the specific gravity of the recovered oil; on the formation of benzene, toluene, and xylene in the recovered oil; on their formation on the basis of oil used; on the distillate to 170° C. and the sp. gr. of the distillate; on the sp. gr. of the benzene, toluene, and xylene cuts at 15.5° C.; and on the distillate from the recovered oil above 170° C., as shown by the distillation cuts and the specific gravity.

711. EGLOFF, GUSTAV, TWOMEY, T. J., AND MOORE, R. J. The cracking of paraffin-base oils. The time factor and temperature factor under pressure. *Met. and Chem. Eng.*, vol. 15, Nov. 1, 1916, pp. 523-529. Describes experiments to determine the type of oils which lend themselves most readily to the formation of aromatic hydrocarbons, gasoline, and unsaturated hydrocarbons, and the percentage yield of these products. A gas oil from Pennsylvania crude was cracked at temperatures from 400 to 750° C., constant pressure of 150 pounds and varying rates of flow. Paraffin-base oils yielded uniformly smaller percentages of these products than naphthene oils.

712. ——— The effect of temperature and the time factor in the formation of gasoline in the gas phase at constant pressure. *Jour. Ind. and Eng. Chem.*, vol. 8, December, 1916, pp. 1102-1105. Describes procedure and results of experiments with Pennsylvania crude, which was subjected, after the gasoline had been removed, to varying temperatures (600, 650 and 700° C.), constant pressure of 150 pounds, and varying rates of flow to form gasoline from the residue.

713. ——— The thermal and pressure decomposition of a naphthene base oil in the gas phase. *Met. and Chem. Eng.*, vol. 15, Oct. 1, 1916, pp. 387-392. Describes the effect of temperature and pressure on a naphthene base oil in the formation of gasoline, unsaturated hydrocarbons, and aromatic hydrocarbons. Two oils gave widely differing percentages of gasoline, etc., under the same conditions of temperature and pressure, showing the importance of the starting oil, when maximum yields of certain types are desired.
714. FISCHER, FRANZ. Über die Gewinnung flüssiger Kohlenwasserstoffe durch Einwirkung von Aluminiumchlorid auf Naphthalin unter Druck (Obtaining liquid hydrocarbons by the action of aluminum chloride on naphthalene under pressure). *Ber. deut. Chem. Gesell.*, Bd. 49, February, 1916, pp. 252-259; *Chem. Abs.*, vol. 10, Apr. 20, 1916, p. 1039. Naphthalene was treated with 4 per cent of its weight of $AlCl_3$ in an autoclave for a short time at about 330° , about 40 per cent being converted into liquid hydrocarbons, and the remainder into pitch and coke. The oil obtained may be used as an illuminant in a burner with a powerful air-draught, such as are designed for Russian oils.
715. FISCHER, FRANZ, AND NIGGEMANN, HERMANN. Formation of toluene by the action of anhydrous aluminium chloride on xylene and benzene. *Ber. deut. Chem. Gesell.*, Bd. 49, 1916, pp. 1475-1482; *Jour. Soc. Chem. Ind.*, vol. 35, Oct. 16, 1916, p. 1006. About 12 per cent of toluene, together with a certain proportion of benzene and of higher homologues of xylene may be obtained by boiling xylene with from 2 to 4 per cent of $AlCl_3$ for two hours. Traces of toluene are also obtained by the action of $AlCl_3$ on benzene.
716. PETROLEUM REVIEW. Aromatisation of petroleum. Vol. 35, Oct. 7, 1916, p. 285. Reviews a Russian article in "Neftanoe Dielo," by I. Gutt, on the pyrogenisation products of petroleum, such as ethylene, butadiene, isoprene, etc., and gives their characteristics.
717. RITTMAN, W. F., AND EGLOFF, GUSTAV. Thermal reactions in the vapor phase of various coal-tar oils and distillates. *Met. and Chem. Eng.*, vol. 14, Jan. 1, 1916, pp. 15-18. Gives results of experiments made to test the utility of various low-grade coal-tar oils and distillates as original material for the production of toluene and benzene.
718. RITTMAN, W. F., AND TWOMEY, T. J. Equilibrium relations among aromatic hydrocarbons produced by cracking petroleum. *Jour. Ind. and Eng. Chem.*, vol. 8, January, 1916, pp. 20-22. Experiments with a gas oil, distillate from Pennsylvania crude, showed that there are definite relations among the percentages of aromatic compounds formed, these percentages being fixed by the degree of cracking. Gives a table of percentages by weight of each hydrocarbon constituent in eight runs.
719. TIKHVINSKI, M. M. The aromatization of petroleum. *Petroleum Rev.*, vol. 35, Nov. 11, 1916, p. 386; Nov. 18, p. 418; Nov. 25, p. 433; Dec. 2, p. 454. Gives classification of petroleum as to their aromatic hydrocarbon content and explanation of the value of aromatization. Reviews early patents for the pyrogenetic decomposition of petroleum. Describes apparatus required by modern methods and their procedure. Predicts that aromatization will supply material for dyes, explosives, and pharmaceutical preparations.
720. ZANETTI, J. E. Thermal decomposition of the propane-butane fraction from natural-gas condensate. *Jour. Ind. and Eng. Chem.*, vol. 8, August, 1916, pp. 674-678. Investigation of composition of cracked gases with respect to "unsaturated" and hydrogen formation; the amount of tar formed

and its composition; the composition of the unsaturated hydrocarbons; and the influence of catalyzers.

721. ZANETTI, J. E., AND LESLIE, E. H. The thermal decomposition of the ethane-propane fraction from natural gas condensate. *Jour. Ind. and Eng. Chem.*, vol. 8, September, 1916, pp. 777-779. A study of a fraction that is used mainly for welding and lighting; follows the same lines of investigation as given in a former paper. (See No. 720.)
See also Nos. 672, 724.

ELEMENTARY ANALYSES.

SULPHUR.

722. SCHEIBLER, HELMUTH. Chemical constituents of bituminous tar oil rich in sulphur (ichthyol oils). *Ber. deut. chem. Gesell.*, Bd. 49, 1916, pp. 2595-2600.

ANALYTICAL NUMBERS (IODINE, BROMINE, SAPONIFICATION, ACETYL, SULPHURIC ACID, ABSORPTION, ETC.).

723. RADCLIFFE, L. G., AND POLYCHRONIS, C. The iodine absorption and tendency to sludge formation of some hydrocarbon oils. *Jour. Soc. Chem. Ind.*, vol. 35, March 31, 1916, pp. 340-343. Tabulates results of experiments using different reagents, different lengths of time, and different temperatures. Discusses relation between percentage of iodine absorbed and percentage of sludge deposited by an oil, and gives table showing this relation.
See also Nos. 736, 767.

HYDROCARBONS, HYDROCARBON DERIVATIVES.

724. BROOKS, B. T., AND HUMPHREY, I. W. The presence of benzene homologs in the high boiling distillates of petroleum. *Jour. Am. Chem. Soc.*, vol. 38, February, 1916, pp. 393-400. Experiments with heavy oils, paraffin wax and synthetic phenyl paraffin for the identification of the higher benzene homologs. Benzene, toluene, and *m*-xylene were found among the products from the cracking of heavy petroleum oils by distillation up to 420° and 100 lb. pressure and by heating with anhydrous AlCl_3 up to 300°. Commercial paraffin wax did not yield these products under the conditions named, but synthetic phenyl paraffin yielded benzene and toluene.
725. SCHREYER, B., AND KRAGEN, S. Ueber Oxydation von Erdölprodukten (On the oxidation of petroleum products). *Petroleum Ztschr.*, Jahrg. 11, Mar. 1, 1916, pp. 521-522; *Ztschr. angew. Chem.*, Jahrg. 29, 1916, Ref., p. 294. Different petroleum fractions, when oxidized with air in the presence of powdered dry sodium hydroxide and mercury, yielded from 1 to 1½ per cent of naphthenic acids, which were viscous liquids, having the characteristic odor; and red and green in color. Other oxidation products were in the form of yellow viscous oil with a pleasant odor.

OXYGEN COMPOUNDS.

PETROLEUM ACIDS AND ACID CONTENT.

726. VON KOZICKI, G., AND VON PILAT, S. Zur Kenntnis der Naphthensäuren (Naphthenic acids). *Petroleum Ztschr.*, Jahrg. 11, Jan. 5, 1916, pp. 310-316; *Ztschr. angew. Chem.*, Jahrg. 29, 1916, Ref., p. 175; reviewed in *Jour. Soc. Chem. Ind.*, vol. 35, May 15, 1916, p. 526. Describes experiments in which crude naphthenic acids (sp. gr. 0.9403 at 15° C.) from a Galician petroleum

distillate were purified by conversion into potassium salts and extraction with petroleum spirit, then methylated and the methyl esters fractionated. By saponification of the various fractions naphthenic acids from $C_7H_{13}CO_2H$ up to $C_{14}H_{27}CO_2H$ were isolated. Experiments proved that the naphthenic acids are carboxylic acids.

See also No. 670.

HALOGEN COMPOUNDS.

727. BEDFORD, C. W. The production of the lower chlorides of methane from natural gas. *Jour. Ind. and Eng. Chem.*, vol. 8, December, 1916, pp. 1090-1094. Investigation in chlorination of the methane available in natural gas with a view to transforming it into chloroform instead of carbon tetrachloride. Reviews former work on this subject, describes experiments, and states conclusions.
- 727a. FICHTER, F., AND GLAUZENSTEIN, LUPU. (Electrochemical chlorination of benzene and toluene). *Ber. deut. chem. Gesell.*, Bd. 49, 1916, pp. 2473-2487. *Jour. Soc. Chem Ind.*, vol. 36, Feb. 28, 1917, p. 207. *Chem. Abs.*, vol. 4, Oct. 10, 1917, pp. 2667-2668. Glacial acetic acid used to form a homogeneous solution with the hydrocarbon, making a better electrolyte.

REDUCED HYDROCARBONS, HYDROGENATION, AND CATALYSIS.

728. HAMBURGER, L. The hydrogenation of oils. *Chem. Weekblad, Jahrg. 13*, 1916, pp. 2-13; *Chem. Abs.*, vol. 10, Mar. 20, 1916, p. 826. Gives results of a study of the influence of temperature, pressure, divisibility of the catalyst, and the kind of oil (impurities) on the hydrogenation process.
729. KELBER, C. Die katalytische Hydrogenisation organischer Verbindungen mit unedlen Metallen bei Zimmertemperatur (The catalytic hydrogenation of organic compounds by means of base metals at ordinary temperatures). *Ber. deut. Chem. Gesell.*, Bd. 49, January, 1916, pp. 55-63; *Jour. Soc. Chem. Ind.*, vol. 35, Mar. 31, 1916, p. 382. Nickel salt is precipitated in presence of a suitable carrier, and then reduced at $450^\circ C$. The catalyst produced has an activity greater than that of nickel reduced at a much lower temperature.
730. PICKET, AIMÉ, AND LERCZYNSKA, I. Action du chlorure d'aluminium sur le pétrole. *Bull. Soc. chim.*, t. 19, September, 1916, pp. 326-334. Gives experiments to determine the effect of $AlCl_3$ on the higher fractions of petroleum from different localities. Fractions resembling "natural benzine" and natural asphalt were obtained.

See also No. 700.

ASH CONTENT, see No. 670.

MISCELLANEOUS AND SPECIFIC TESTS.

731. FRIEDMANN, WALTER. Einwirkung von Schwefel auf Kohlenwasserstoffe unter Druck (Action of sulphur on hydrocarbons under pressure). *Petroleum Ztschr.*, Jahrg. 11, Sept. 20, 1916, pp. 1299-1302. Gives results of experiments with n-pentane, n-hexane, and n-octane.
732. ——— Einwirkung von Schwefel auf Naphthene unter Druck (Action of sulphur on naphthenes under pressure). *Petroleum Ztschr.*, Jahrg. 11, July 5, 1916, pp. 978-982. Describes compounds isolated when cyclohexane, methyl-cyclohexane, and octonaphthene were heated with sulphur.
733. ——— Einwirkung von Schwefel auf Octane unter Druck (Action of sulphur on octane under pressure). *Ber. Deut. Chem. Gesell.*, Bd. 49, 1916,

- pp. 1244-1252. Describes compounds isolated when normal octane is heated in a sealed tube with sulphur.
734. ———. Einwirkung von Schwefel auf Octylene unter Druck (Action of sulphur on octylene under pressure). *Ber. deut. Chem. Gesells.*, Bd. 49, 1916, pp. 1551-1554; *Chem. Zentr.*, 1916, II, pp. 391-392. Various compounds were isolated.
735. ———. Einwirkung von Schwefel auf Olefine unter Druck (Action of sulphur on olefine under pressure). *Petroleum Ztschr.*, Jahrg. 11, 1916, pp. 693-697; *Ztschr. angew. Chem.*, Jahrg. 29, 1916, Ref., p. 358; *Chem. Zentr.*, 1916, I, p. 1285. Describes compounds isolated from heptylene, octylene, and hexadecylene when heated with sulphur.
736. WATERS, C. E. Data on the oxidation of automobile cylinder oils. Tech. Paper 73. U. S. Bureau of Standards, 1916, 20 pp. Gives rate of oxidation of three oils when exposed to sunlight and air, and determinations of the increase in weight, the increase in acidity and carbonization values, as well as changes in the Maumene and iodine numbers and in the densibility. Also gives changes in the carbonization values of the three oils and of eight others, when heated for different lengths of time at a given temperature, and for the same time at different temperatures. Conclusion reached was that the carbonization value is independent of the flash and fire points and of the evaporation loss on heating.
- See also Nos. 759, 1303.

PHYSIOLOGICAL PROPERTIES.

737. BROOKS, B. T. The nature of pharmaceutical naphthene oil (liquid petrolatum). *Jour. Am. Med. Assoc.*, vol. 66, Jan. 1, 1916, pp. 24-26. Discusses the chemical character, properties, mode of manufacturing, and testing of oils of this class.
738. OILDOM. "Petromortis." Vol. 6, Aug., 1916, pp. 376-380. Describes asphyxiation from exhaust gases from automobile engines. Article is reprinted from the "Travelers standard."

ANALYTICAL METHODS; DETERMINATION OF PHYSICAL AND CHEMICAL PROPERTIES; APPARATUS AND PROCEDURE.

739. AMERICAN GAS INSTITUTE. Gas chemists handbook. New York, 1916, 345 pp. Contains standard methods of analysis of gas oil, methods of analysis of paint vehicles, including petroleum, and tests for lubricating oils.
740. CHÉNEVEAU, C. Balance pour la détermination rapide des densités de corps liquides et solides (Balance for the rapid determination of the densities of liquid and solid bodies). *Rev. gén. Sci.*, t. 27, Aug. 15-30, 1916, p. 404. Paper read before the Société Française de Physique, June 6, 1916. Describes principle and use of apparatus.
741. DANIELS, FARRINGTON. An adiabatic calorimeter. *Jour. Am. Chem. Soc.*, vol. 38, Aug., 1916, pp. 1473-1480. Gives description of a modification of the Richards type, and discusses its advantages, chief of which is the elimination of cooling corrections, thereby excluding errors from precision work and saving time in commercial work.
742. MENDELSON, SIMON. Modified flash point apparatus. *Chemist-Analyst*, October, 1916, pp. 10-11. Describes apparatus and enumerates its advantages.
743. METALLURGICAL AND CHEMICAL ENGINEERING. An industrial and laboratory gas calorimeter. Vol. 14, May 15, 1916, p. 610. Describes calorimeter

- of Junker type in which heat from flame of either a liquid or gas fuel is introduced into a stream of water and calorific value of fuel is calculated from amount of water, of gas, and rise in temperature of water.
744. OILDOM. A rational basis for motor gasoline specifications. Vol. 6, July, 1916, pp. 334, 336. Abstract from paper read before American Petroleum Society, San Francisco, Oct. 25, 1915, by P. W. Prutzman. Gives tests to be used in checking specifications.
745. REEVE, C. S., AND PRITCHARD, F. P. A new penetration needle for use in testing bituminous materials. Jour. Agr. Research, vol. 5, Mar. 13, 1916, pp. 1121-1126. An easily reproduced needle is described which might be used as a standard, as there is no recognized established standard with which new needles may be compared.
746. RICHARDSON, CLIFFORD. The formolite reaction of Nastukoff as applied to oil residuals and natural asphalts. Jour. Ind. and Eng. Chem., vol. 8, April, 1916, pp. 319-321; discussion, p. 663. Gives results of attempts to apply the reaction between heavy oils and formaldehyde and sulphuric acid, as worked out by Nastukoff, to asphalts as a means of characterizing and differentiating them.
747. SEVERIN, E. Methodical analysis of petroleum. Petroleum Rev., vol. 35, Sept. 16, 1916, p. 226; Sept. 23, p. 247. Extracts from a Roumanian article. Outlines a method of analysis as worked out with Campina (Roumanian) petroleum, which consists (1) of treatment with sulphuric acid for separating the aromatic hydrocarbons and olefines, the ethylenes and non-saturated naphthenes, and (2) of treatment with a nitro-mixture for isolating the benzenic homologues in a solid state, thus allowing them to separate from the paraffins and saturated naphthenes.
748. UNITED STATES BUREAU OF STANDARDS. The testing of hydrometers. Circular 16, 1916, rev. ed., 16 pp. Presents specifications for hydrometers. Describes tests performed by the Bureau, and gives directions for submitting apparatus for test, and fees for testing.
- See also Nos. 632, 634, 636, 637, 640-642, 651, 654, 656, 658, 659, 666, 671-675, 678, 681, 682, 684, 685, 689, 691, 693, 698, 699, 702, 710-713, 723, 759, 763, 767, 771, 772, 921, 931.
- POWER AND EFFICIENCY TESTS, see Nos. 638, 977, 982, 989, 1032, 1248.

PATENTS.

749. BAUER, H. F. Viscosity testing apparatus. U. S. patent 1,190,085, July 4, 1916.
750. BERG, JAMES, AND BERG, G. Hydrometer. U. S. patent 1,179,996, Apr. 18, 1916.
751. BLICHFELDT, S. H. Production of emulsions. U. S. patent 1,192,492, July 25, 1916.
752. BRINDLE, R. G. Testing device (specific gravity). U. S. patent 1,178,902, Apr. 11, 1916.
753. BURRELL, G. A. Gas-analyzing apparatus. U. S. patent 1,176,199, Mar. 21, 1916.
754. DODGE, H. P. Specific-gravity measuring means. U. S. patent 1,189,431, July 4, 1916.
755. LORENZ, C. O. Viscosometer. U. S. patent 1,187,000, June 13, 1916.
756. MOELLER, M. E. Hydrometer. U. S. patent 1,177,128, Mar. 28, 1916.
757. SMITH, H. F. Method of determining the total available heat of gaseous fuel. U. S. patent 1,189,300, July 4, 1916.

SPECIFICATIONS FOR PURCHASES, ETC.

- 758** HEYNE, H. R. Petroleum products and their requirements. *Fuel Oil Jour.*, vol. 7, January, 1916, pp. 39-41. Gives important points in general specifications stated for gasoline, kerosene, gas oil, fuel oil, lubricating oil and signal oil.

See also Nos. 10, 266, 688, 690, 744, 777.

VARIOUS SPECIES AND FRACTIONS OF BITUMENS AND PETROLEUMS.

GASEOUS PRODUCTS, INCLUDING NATURAL GAS.

- 759.** BURRELL, G. A., AND JONES, G. W. Methods of testing natural gas for gasoline content. Tech. Paper 87 U. S. Bureau of Mines, 1916, 26 pp. Deals especially with the applicability of the compression and condensation process and the absorption process for recovering gasoline from natural gas.
- 760.** BURRELL, G. A., AND ROBERTSON, I. W. The compressibility of natural gas at high pressures. Tech. Paper 131, U. S. Bureau of Mines, 1916, 11 pp. Results of investigations of the natural gas at Pittsburgh, Pa. Calls attention to the fact that the pressure-volume relation of Boyle's law does not hold for natural gas under high pressure, and points out possible errors in measuring natural gas.
- 761.** ——— Vapor pressures of various compounds at low temperatures. Tech. Paper 142, U. S. Bureau of Mines, 1916, 32 pp. Describes experiments using ethylene and ethane, propane, propylene and butane, acetylene, ammonia, sulphur dioxide, and nitrous oxide.
- 762.** DVOROVITZ, PAUL. The gasification of coal and liquid hydrocarbons. *Petroleum Rev.*, vol. 35, Dec. 16, 1916, pp. 485-486. Reviews results of experiments carried on twenty-three years ago by the author, and recently corroborated by the investigations of Pictet, Ramseyer and Kaiser (*see* No. 764). After concluding that liquid hydrocarbons exist in coal, the author devised a method of gasifying coal so as to avoid the destruction of the volatile matters in it, and thus obtained illuminating gas equal to 31,000 candles per ton of coal, 8 gallons of paraffin, 100 lb. of pitch, and 4 gallons of by-products of great value.
- 763.** EARHART, R. F., AND WYER, S. S. Deviation of natural gas from Boyle's law. *Trans. Am. Soc. Mech. Eng.*, vol. 38, 1916, pp. 285-308; discussion, pp. 308-329. Gives results of an investigation made by measuring natural gas samples from various parts of the United States. The apparatus is described and illustrated, the order of conducting the tests are given, and the results recorded in tables and curves. (*See also* No. 639.)
- 764.** PICTET, AIMÉ, RAMSEYER, L., AND KAISER, O. Sur quelques hydrocarbures contenus dans la houille (On some hydrocarbons contained in coal). *Compt. rend.*, t. 163, Oct. 9, 1916, pp. 358-361. Gives results of experiments to ascertain whether hydrocarbons are contained in coal or whether they are pyrogenetic decomposition products. Concludes that coal is a solid hydrocarbon material impregnated with a liquid which is closely allied to petroleum. (*See also* No. 762.)

See also Nos. 203, 204, 257, 480, 639, 699, 753, 757, 921.

VOLATILE FRACTIONS, INCLUDING MOTOR OILS, GASOLINES, NAPHTHAS, BENZINES.

765. BURRELL, G. A. Gasoline and how to use it. Boston, 1916, 281 pp. Gives general information on the nature of gasoline, methods of its production, and use as motor fuel.
766. STRACHE, H. Das Benzin, seine Gewinnung, Beschaffenheit, und Lagerung (Benzine, its production, properties and storage). Petroleum Ztschr., Jahrg. 11, Mar. 1, 1916, pp. 522-527; Mar. 15, 1916, pp. 569-575.
- See also* Nos. 10, 744, 758, 977, 989, 1253.

LUBRICATING, TRANSFORMER, AND SWITCH OILS.

767. INSTITUTION OF ELECTRICAL ENGINEERS. Insulating oils. Jour., vol. 54, 1916, pp. 497-504. Report on properties and methods of testing transformer and switch oils, giving detailed methods of investigation for the following characteristics: tendency to sludge, loss by evaporation, flash point, viscosity, acidity or alkalinity and iodine value, specific gravity, cold test, moisture absorption, dielectric test, specific resistance, thermal transference, specific heat.
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- See also* Nos. 641, 649, 651, 653, 657, 659, 663, 665, 667-671, 739, 758, 931, 1017.

PARAFFIN, OZOKERITE, CERESIN, VASELINE, ETC.

769. MARCUSSE, J. The composition of the solid hydrocarbons of petroleum, paraffin and ceresin. Mitt. K. Materialprüf., Jahrg. 33, 1916, pp. 415-426; Chem. Zentr., 1916, I, p. 1285. Describes investigations relating to the detection and determination of paraffin and ceresin.
770. PETROLEUM ZEITSCHRIFT. Paraffin aus Erdöl (Paraffin from petroleum). Jahrg. 11, Sept. 6, 1916, p. 1244. Abstract of Russian article discussing the properties and uses of paraffin and its mixture with other waxes.
- See also* Nos. 107, 128, 129, 131, 646.

ASPHALT, TARS, ETC.

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772. GMEY, M. Examination of asphalt. Mitt. K. Materialprüf., Jahrg. 33, 1916, pp. 210-220; Jour. Soc. Chem. Ind., vol. 35, May 15, 1916, pp. 525-526. Describes Richardson's penetrometer and the "ductilometer." Tests show that differences in degrees of softness increased with rise of temperature from 15° to 25°. Asphalts and asphaltic material containing less than 96 per cent of bitumen can not be directly tested for ductility.
773. GRAEFE, E. Zur Unterscheidung von Natur- und Kunst-Asphalt (Distinguishing between natural and artificial asphalt). Ztschr. angew. Chem. Jahrg. 29, I, Jan. 25, 1916, pp. 21-25. Discusses formation of natural asphalts and manufacture of oil asphalts. Describes test for sulphur. Re-

actions given by different kinds of asphalt are recorded. Gives table of sulphur content of various kinds of asphalt, pitches, etc.

774. LAXTON, J. L. The maintenance of sheet pavements. *Jour. Eng. Club*, St. Louis, vol. 1; September-October, 1916, pp. 346-355. Includes general description of asphalt and laboratory tests. Describes process of oiling pavements as dust preventive and for waterproofing.

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777. ——— Standards for products of the asphalt industry. *Mitt. K. Materialprüf.*, Jahrg. 34, 1916, 40-55; *Jour. Soc. Chem. Ind.*, vol. 35, Nov. 15, 1916, pp. 1099-1100. Gives results of investigations and methods of analysis worked out by the author and others. Natural and artificial asphalts may be distinguished, mixtures identified, etc. Reviews briefly specifications adopted by various cities and private consumers for asphalt products, and gives standards for the manufacture of roofing felt.

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See also Nos. 16, 235, 632, 684-691, 746, 935, 936.

SHALES, MISCELLANEOUS SOLID BITUMENS, LAMPBLACK, AND COKE.

780. HELM, W. H. Peat as a source of fuel oil. *Jour. Roy. Soc. Arts*, vol. 64, Jan. 7, 1916, pp. 150-151. Gives a short discussion of the value and possibilities of peat oil as fuel. Emphasizes the absence of sulphur as a distinct advantage, particularly in naval engines.

See also Nos. 122, 124, 260-263, 298.

REFINING AND REFINERIES.

PROCESSES AND PRACTICES.

781. ASHWORTH, A. A. Economy in refining. Paper read before Western Petroleum Refiners' Association, Kansas City, Mo., Nov. 16, 1916. Published in pamphlet, "Petroleum Refining," by Western Petroleum Refiners' Association, Kansas City, Mo., pp. 31-35. Discusses loss of gasoline content of crude by lax methods of refining, the extravagant use of fuel, and use of properly designed condensers. Suggests saving of gases that escape condensation. Mentions the economical operation of refineries in Europe.
782. CAMPBELL, ANDREW. The refining of petroleum. Jour. Inst. Petroleum Tech., vol. 2, June, 1916, pp. 274-295; discussion, pp. 295-302. Gives a sketch of process and plant for "straight" refining from a refiner's point of view. Describes process for distillation, paraffin extraction and refining, and chemical treatment, giving methods and apparatus for each.
783. GRANT, E. E. Fuel situation. Gas Engine, vol. 18, Sept., 1916, pp. 446-451. Discusses various gasoline processes as a means of increasing the yield of gasoline, and the adaptation of kerosene as fuel.
784. KNOCH, F. E. Oil refining. Oildom, vol. 6, Feb., 1916, pp. 63-65, 67. Discusses principles of refining and the properties of hydrocarbons.
785. ROBINSON, F. C. The manufacture of petroleum products. Oildom, vol. 6, January, 1916, pp. 16, 18, 20, 22, 24. Products of petroleum are enumerated and the principles of refining are described.
786. STRATFORD, C. W. The story of oil. Petroleum, vol. 2, November, 1916, pp. 39-40. Describes general process of distillation, and gives diagrams of stills, tanks, etc., used.
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DEHYDRATING AND CLEANING.

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789. HELLSING, G. H. Separating water from the crude distillate from the dry distillation of bituminous shale. Swedish patent 41,163, Aug. 16, 1916.

DISTILLATION OF LIQUIDS.

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791. TUDOR, HARRY. Process and apparatus for distilling heavy crude petroleum. Canadian patent 172,706, Oct. 24, 1916.

CONTINUOUS PROCESSES.

792. PETROLEUM WORLD. Trumble refining process described. Vol. 13, Jan., 1916, pp. 17-22. Detailed description of process, with illustrations from British patent specifications. (*See also* Nos. 806, 807.)

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794. BURLESON, H. L., AND PRUTZMAN, P. W. Apparatus for the distillation and fractionation of petroleum and other liquids. U. S. patent 1,180,237, Apr. 18, 1916; Canadian patent 170,097, June 13, 1916.
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796. FORWARD, C. B. Method of treating crude oil. U. S. patent 1,181,301, May 2, 1916.
- 796a. KRICKHORN, G. Combining two distilling retorts for distilling tar, mineral oils, or oils and fats. German patent 288702, Dec. 6, 1914.
797. LACKMAN, ALEXANDER. Apparatus for distilling mineral oils. U. S. patent 1,171,524, Feb. 15, 1916.
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801. ROSS, S. J., AND SCHOFIELD, HARRY. Apparatus for the distillation of oils. U. S. patent 1,204,492, Nov. 14, 1916; English patent 15,538, Dec. 24, 1914.
802. SAMPSON, C. E., AND WOODS, W. Crude-oil still. U. S. patent 1,177,816, Apr. 4, 1916.
- 802a. SCHLUPPER, SIEGMUND. Process of distilling organic compounds. English patent 4,694, Mar. 25, 1915.
803. SMITH, J. S. Distilling petroleum. English patent 6,660, 1916. Canadian patent 171,760, Sept. 5, 1916.
804. SOCIÉTÉ E. BARBET ET FILS ET CIE. Distilling benzol, etc., from wash oils. English patent 100,493, 1916; application 7051. May 17, 1916.
805. STEINSCHNEIDER, L. Fractional distillation of petroleum or tar oils in vacuo. German patent 285, 969, Apr. 15, 1913.
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807. ——— Process and apparatus for making asphaltum. U. S. patent 1,182,601, May 9, 1916.

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809. FORWARD, C. B. Process of reducing crude petroleum. U. S. patent 1,202,823, Oct. 31, 1916; Canadian patent 171,582, Aug. 29, 1916.
810. ——— Treating crude petroleum. U. S. patent 1,189,083, June 27, 1916; English patent 103,572, Feb. 1, 1917; application 5,126, Apr. 7, 1916.
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812. ——— Process of distilling petroleum. U. S. patent 1,199,463, Sept. 26, 1916.
813. KÜHN, F. A. Distilling petrol. English patent 102,903, Jan. 4, 1917; application 11,306, Aug. 10, 1916; Canadian patent 173,621, Dec. 5, 1916.
814. TIMMINS, J. R., AND SWAIN, O. Apparatus for refining oil. U. S. patent 1,179,243, Apr. 11, 1916.
- WITH INERT GASES OR STEAM, see No. 641.

CRACKING OF LIQUIDS.

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817. SELINSKY. Distillation (cracking) of petroleum. Jour. Russ. Phys. Chim. Obschestwa, vol. 9, 1915; Chem. Ztg., Jahrg. 40, 1916, Ref., p. 285; Jour. Soc. Chem. Ind., vol. 35, Sept. 30, 1916, p. 957. Shows that the carbonaceous deposit formed when petroleum is cracked in iron tubes may be decomposed with hydrochloric acid, when it produces hydrogen, methane and olefines. States that the best yields of benzene and toluene are obtained when petroleum is cracked with alumina and titanium oxide as catalyzers.
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821. STUTZ, C. C. Conversion of hydrocarbons. New Zealand patent 37,692, July 19, 1916.
- 821a. VON GROELING, A. F. G. C. P. J. Distilling and cracking oils. English patent 16,713, July 13, 1914.

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827. RITTMAN, W. F., DUTTON, C. B., AND DEAN, E. W. Manufacture of gasoline and benzene-toluene from petroleum and other hydrocarbons. Bull. 114, U. S. Bureau of Mines, 1916, 263 pp. Reviews the literature on the cracking of petroleum. Gives detailed results of experiments made in the development of improved processes for manufacturing gasoline and benzene-toluene, also, some of the results in working out the benzene-toluene process on a commercial scale.

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- 828a. GRAEFFE, E., AND VON WALTHER, R. Cracking heavy hydrocarbons. English patent 25,510, Nov. 7, 1913.

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830. ——— Manufacture of volatile hydrocarbons for preparing oil colors. Austrian patent 72,131, July 10, 1916.
- 830a. HALL, W. A. Cracking oils. English patent 1,594, Feb. 1, 1915.
831. ——— Process for the conversion of heavy hydrocarbons into lighter hydrocarbons. U. S. patent 1,175,909, Mar. 14, 1916.
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- 832a. HIGGINS, WILLIAM. Cracking heavy hydrocarbon oils. English patent 9,418, June 28, 1915.
- 832b. IROLINE COMPANY OF AMERICA (MARKS, E. C. R.). Cracking oils, etc. English patent 3,327, Mar. 2, 1915. French patent 477,891, Mar. 5, 1915.
- 832c. LEWIS, G. P. Cracking oils. English patent 7,535, May 19, 1915.
- 832d. RITTMAN, W. F. Benzene; toluene. English patent 13,100, Sept. 13, 1915. Australian patents 16,909, July 22, 1915; 17,509, Sept. 23, 1915. New Zealand patent, 36,459, July 15, 1915.
- 832e. ——— Cracking oils. English patents 9,162, 9163, June 22, 1915.
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- 834a. STANDARD OIL Co. Process and apparatus for converting petroleum of high boiling point into products of lower boiling point. French patents 477,404, Jan. 26, 1915; 477,829, Feb. 27, 1915. 18, 1916; Swiss patent 72,173, Apr. 17, 1916.
835. SYNTHETIC HYDRO-CARBON Co. Light hydrocarbons. French patent 479,210, Mar. 1, 1916.
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836. ——— Single-phase chemical reactions. Australian patent 121, Jan. 20, 1916; New Zealand patent 37,088, Jan. 11, 1916.
- 836a. ——— Treatment of xylene and other aromatic hydrocarbons to obtain lower hydrocarbons of the same series. French patent 479,786, Sept. 20, 1915.
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- 837b. GESELLSCHAFT FÜR VERWERTUNG VON KOHLENSTOFF-VERBINDUNGEN. Cracking high-boiling hydrocarbons. German patent 284,118, July 20, 1912.
- 837c. HALL, W. A. Distilling and cracking oils, etc. English patent 8,836, June 15, 1915.
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- 837e. LAMPLOUGH, F. Converting heavier (mineral) oils into lighter oils. English patent 16,830, Nov. 30, 1915.
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843. ——— Cracking high-boiling petroleum oils. Norwegian patent 26,668, Feb. 14, 1916.
844. ——— Cracking petroleum residues. Dutch patent 1,656, Oct. 16, 1916.
- 844a. ——— Distilling and cracking oils. English patent 1,226, Jan. 26, 1915.
845. ——— Hydrocarbon decomposition. Canadian patents 167,986, 167,988, Mar. 7, 1916.
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849. LEWIS, G. P. Cracking of hydrocarbons. English patent 2,509, Feb. 19, 1916.
850. Low, F. S. Process of making gasoline. U. S. patent 1,192,653, July 25, 1916.
- 850a. McAFEE, A. M. Cracking oils. English patents 22,243, 22,244, Nov. 9, 1914.
- 850b. ——— Cracking and refining oils. English patent 22,924, Nov. 23, 1914.
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852. RODMAN, HUGH. Process of manufacturing carburizing material and oil distillates. U. S. patent 1,209,336, Dec. 19, 1916.
- 852a. SABATIER, P. AND MAILHE A. Cracking oils. English patent 16,791, July 14, 1914. French patent 477,212, June 3, 1914.
- 852b. SOCIÉTÉ LYONNAISE DES EAUX ET DE L'ÉCLAIRAGE. Cracking tars and oils. English patents 9,728, 9,729, July 3, 1915.
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BURNERS AND BURNER APPLIANCES.

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See also Nos. 112, 1324.

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- See also Nos. 109, 953, 980, 1324.*

CARBURETORS, VAPORIZERS, AND SPRAYERS.

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1032. PERCY, E. N. Carburetion with different grades of fuel. *Power*, vol. 44, Oct. 17, 1916, pp. 560-562. Gives results of tests with gasoline, kerosene and distillate under different methods of governing. Carburetion with kerosene was not successful for variable conditions, and heavier oils could not be carbureted successfully.
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PATENTS.

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